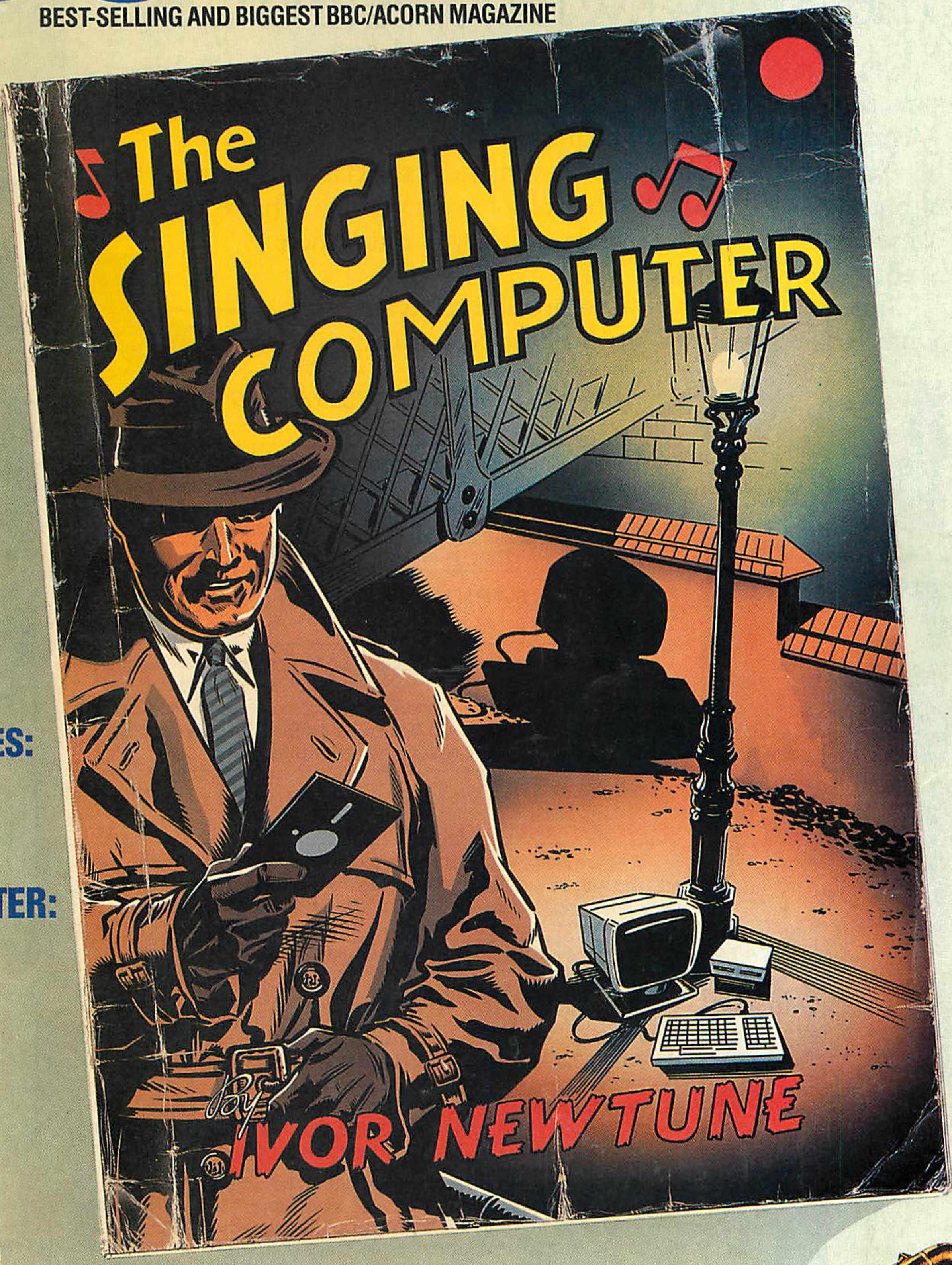
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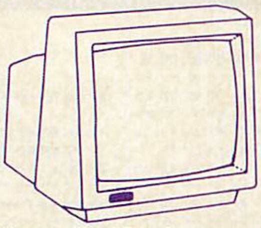
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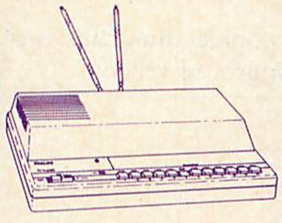
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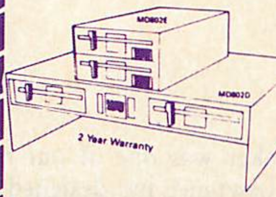
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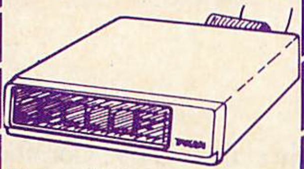
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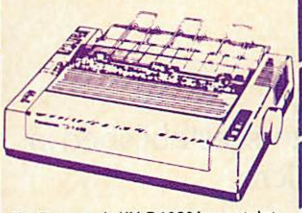
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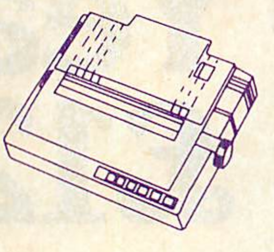
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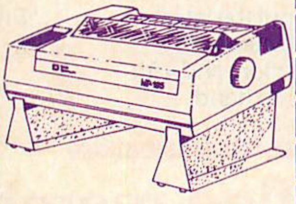
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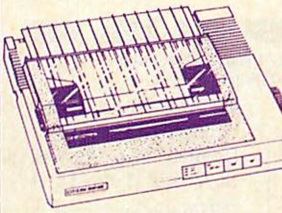
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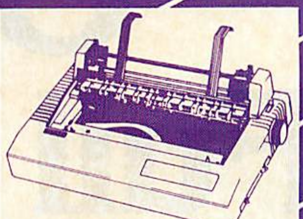
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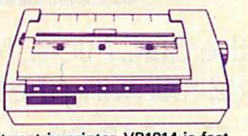
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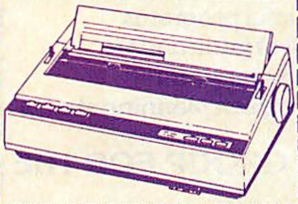
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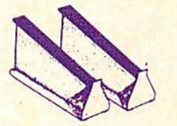
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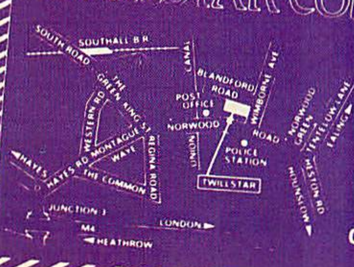
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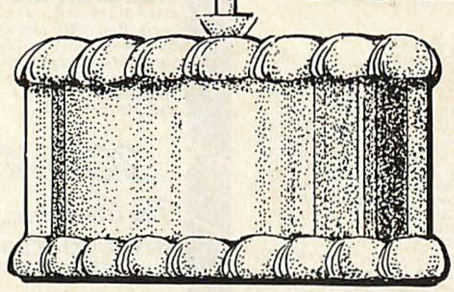
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NEWS



RAM cards and phone link

Briefcase Acorn

Acorn's 16-bit Communicator micro will soon appear in pharmaceutical reps' briefcases.

Advanced Medical Communications, which supplies the pharmaceutical and health markets with communications equipment, has ordered the machine packaged for use on the road. The Spectar II has a bar code reader for data entry and uses credit-card size memory packs, each with up to 4Mb of, say, promotional software.

The Spectar II comes with *View* and *ViewSheet*, a built-in modem and communications software. One version has a flat screen in the briefcase.

MPs row over micro 'gimmick'

By Bill Penfold

A party political row threatens micro-education as fears grow that Britain is in danger of losing its world lead in classroom computers. Opposing party spokesmen have labelled Conservative support as 'a gimmick' and 'complacent'.

Education Secretary Kenneth Baker has hailed as a 'trail blazer' the Government's achievements in supporting school microelectronics.

Focusing on the £3 million a year Microelectronics Education Support Unit (MESU), the Minister claimed countries around the world were following the 'British model'. And the MESU was just part of a 'stream of positive initiatives' planned to consolidate the progress already made, he said.

There was also a £500,000 scheme examining possible interactive video uses in schools, plus a £750,000 allocation for developing a database of curriculum materials.

But Labour's Shadow Education Secretary Giles Radice dismissed the announcements as 'typical Baker gimmicks which are not followed through. Far more resources are still needed to provide equipment plus software and ensure teachers are properly trained.'

Similar criticisms came from the Alliance's Education and Science Spokesman, Paddy Ashdown. Complacency, he feared, was the main danger of the Government's present approach to micro-education, combined with a lack of real commitment.

The Education Secretary reported a recent survey in his department showed an average of 14 micros in every secondary school – an average of one for every 60 pupils.

However, Ashdown argued that the success of a micro-education scheme could not be judged merely by the number of computers. Equally important, he felt, was software development and use of these micros. Radice added: 'It all boils down to money.'

View mastered

A book has been launched for Master owners baffled by the lack of *View* documentation with their machines.

Labouring under the title of *Mastering View, ViewSheet and ViewStore*, Clive Williamson's book should be of value to anyone new to these popular software packages. But it is Master owners who will benefit most as *View* and *ViewSheet* come with the machine but without manuals.

The book covers everything from the basic features through to advanced uses. It is particularly useful when it comes to linking the programs – something which tends to be very confusing in the manuals

The book is published by Sigma at £12.95.

Keyboard extends Music 5000 system

Hybrid Technology has launched a music keyboard to go with its Music 5000 system.

Called the Music 4000, the keyboard attaches directly to the BBC micro through the user port. It comes with a sustain pedal and extensions to the Music 5000's Ample software at a mail order price of £161.

Hybrid originally looked at providing a keyboard for Acorn's Music 500, but decided against it because of poor sales.

With the keyboard, the micro can be used as a straightforward synthesizer, playing music directly using the sounds generated by the Music 5000. But its main use will probably be with the music editing facilities, using the keyboard to enter notes directly onto the staff or into text form, and the recording of music for conversion to music notation.

The keyboard allows up to eight notes to be played simultaneously, and has built-in special effects, including echo, stereo and transposition.

The keyboard software extends the facilities available on the original Ample program. The additions include extra control panels, the keyboard special effects and extra instrument sounds.



Educational

The Spring issue of *School Computer User* is out. It is free to schools, but if you don't qualify it is available for £3.50 for three issues from Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF.

ACP takes over Plus 1

Advanced Computer Products (ACP) has been licensed by Acorn to build, sell and service the Plus 1 add-on interface for the Electron.

The Plus 1 will now be produced under ACP's name, although it will be identical to the Acorn version. 'There's a lot we could change,' explained ACP's John Huddlestone, 'but we don't want to delay launching it.'

Huddlestone hopes to keep the price of the Plus 1 pegged to below £50.

ACP has taken the original moulds and tooling, and will also be obtaining many of the components from Acorn, all in order to help keep costs down.

Acorn stopped making the Plus 1 around 18 months ago, when it had large stockpiles, although it has continued to support the product.

But ACP says that it is getting up to 50 calls a day from customers who need the Plus 1 to run ACP's own products, including the Advanced Plus 4 disc interface, the Plus 5 Tube interface, 1 MHz bus and user port adapter, and ROM and sideways RAM adapters.

Huddlestone attributed the demand for the Plus 1 to the Electron's current low price, 'It's one of the best value micros around', he said. 'But most people want to upgrade it once they've got it.'

Musicians join up

The DCT Database, a viewdata format bulletin board run by Dudley College of Technology, is expanding its popular Ample section for Music 500/5000.

It includes downloadable music files as well as articles, and will be updated every two weeks. Sysop Alistair Johnston from Lancashire hopes to add an 'Ample surgery' to help those with problems.

DCT is free and runs 24 hours a day on (0384) 239944.

Meanwhile, the Musictel network (*AU* December page 15) is expanding. There are now five individual boards with a common structure.

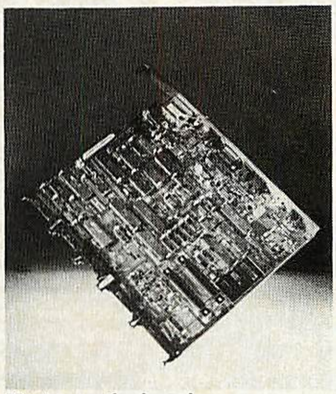
The Musictel 2 board, for example, includes pop and special charts, tips and topical TV listings. There is also downloadable music software.

This is on (0482) 653755. The other boards are: Musictel on 01-455 0843; Musictel 4 on (0695) 421493; Musictel+ on (0843) 590000; and Musictel 500 on 01-458 9704.

Reuters edit on BBC boards

Acorn is making the Master's motherboard available for special applications. Meanwhile Reuters, the news agency, has taken delivery of the final batch of its order of boards based on the BBC micro.

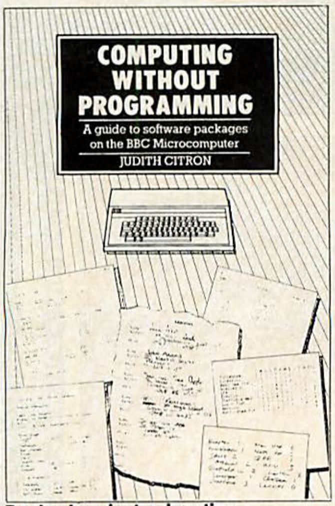
The Master can be bought as a simple board, or in conjuction with any of the other parts of the machine like the keyboard. Most orders are expected from companies to repackage the system.



Master motherboard

Reuters is using the BBC micro boards, known as application processor modules (APMs), to provide editing terminals for its desk staff. The boards are networked using Econet and extra interface circuits. The order has grown from 500 to 2000.

Reuters programmed its own software using BCPL, although BBC software is also used.



Book aimed at education

Don't program, read the book

Computing Without Programming is a book for people who prefer to use ready-made software rather than their own.

A simple introduction to the various types of software for the BBC micro, such as databases and spreadsheets, it takes a close look at a couple of examples of each, with project ideas for using them.

Author Judith Citron runs an Education Computing Advisory Service, which indicates the book's main target — teachers choosing software and those running information technology courses.

Published in paperback by Chapman and Hall, it is priced at £9.50.

The big show

The next *Acorn User* show will be bigger and better than ever.

As usual it will be held at the Barbican in London – in the Red Hall this year – from 23 to 26 July.

One of the notable features about this year's event will be the emphasis on business and educational computing.

There will be a special Business and Educational Day, and a series of associated lectures and seminars, plus the usual discounts, will run throughout the four days of the show.



Plotmate A3M with Linscan

The plot thickens

Linear Graphics is extending its Plotmate range with more plotters and software.

The A4S and A4SM are upgrades of previous A4 plotters. Both have integral keypads for operating settings and protective coatings for the drawing surface. Prices are £370 for the A4S and £450 for the A4SM.

Software includes a £25 disc for Bitstik owners to dump pictures straight to the plotters.

The company also has a software chip, *Termplot*, for the BBC micro to act as a Tektronix graphics terminal to a mainframe. Pictures can be downloaded to the micro's screen or to the plotter.

Linear Graphics is also extending to the end of 1987 its educational support scheme, allowing educational establishments special discounts of up to 30 per cent.

The Comms Column

●'Let your fingers do the walking . . . ' on to computer keyboards. The Yellow Pages are going electronic. Electronic Yellow Pages (EYP) can be dialled direct on:
300/300 baud (0734) 586255 (scrolling text format)
1200/1200 baud (0734) 597231 (scrolling text format)
1200/75 baud (0734) 585151 (viewdata format)

Alternatively, through a gateway port, all Prestel users can enter the system at local call rates with their standard viewdata software. The EYP database starts on Prestel page *381#. The gateway is entered from page *381381#. Keyword searches are used extensively.

EYP has an office-hours helpline on Reading (0734) 506259, and there's a leaflet. Currently, EYP covers Watford, Reading, Guildford, and London. There is no charge other than phone costs.

●Pace's Linnet modem now has BT approval, and is available in the UK. At £139 plus VAT, it offers Hayes compatibility and a wide range of features. Details on (0274) 488211.

●The official Prestel magazine has been taken over by Marathon Videotex. The new management wants more editorial, and for the magazine to be available through newsagents, increasing public awareness of the medium.

●There are 120 more local call lines for accessing Microlink, the low-cost subscription to Telecom Gold, due to a nationwide datalink set up in conjunction with Debenhams Stores. These will cut down on long-distance telephone charges, but the usual PSS costs apply. Details are available on Microlink. Type 'EXTRA' followed by Return at the '>' chevron prompt. Prestel did not comment on when it would introduce its own entry system into BT Gold. *Buzz*

Schools to trial more Domesday discs

The Council for Educational Technology (CET) is to start trials on a range of interactive video disc packages for schools.

The Interactive Video in Schools (IVIS) project has been developing eight packages to cover a wide area of the curriculum in primary and secondary schools. It has also built up a library of images for use in future packages.

The packages include one which simulates a visit to a French town. Others cover design, environmental studies, weather, urban development and mathematics.

Initially, 32 schools will be used for the trials, many of which have already been involved in helping to produce the material. When trials are complete, 30 more schools will be added and will receive all eight packages.

The packages will run on the Domesday Project hardware, which includes a modified Master computer. But other systems are also being looked at.

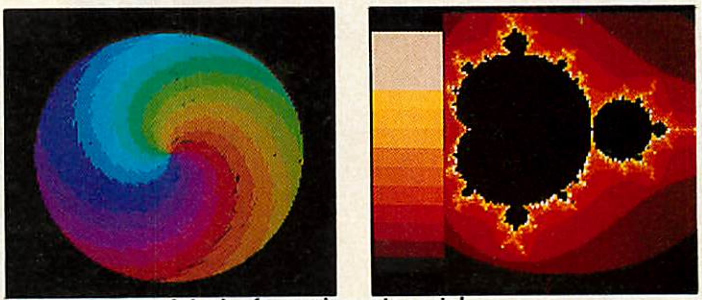
●The National Centre for Information Technology has launched an interactive video package based on the BBC microcomputer and a standard VHS recorder. The interface for the micro costs £275, and includes both control software and database routines to set up the video tape.

●The Interactive '87 exhibition and conference will be held at the Brighton Metropole on 1-3 December 1987.

Board gives 4096 colours

A colour graphics board has arrived from a new company called Saturn Computers.

The Saturn Palette Extension (SPX) board gives a choice of 4096 colours, any 16 of which can be used at once in mode 2. Colours can be redefined in all modes from Basic and machine code, or using an operating system command.



Extended range of shades from primary to pastel

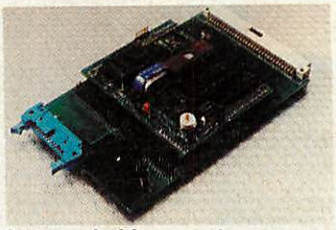
For BBC B and B+ machines, it costs £50. A planned Master version will allow rapid switching of palettes and give more colours on screen – for example, up to four in 80 column modes, instead of the usual two. The Master version will cost £60.

Micro on a Eurocard

Another miniature version of the BBC micro is available for plugging into other terminals.

Cambridge Microprocessor Systems (CMS) has followed up its tiny Microbeeb card with a new version mounted on a 3U Eurocard – a standard electronic component card – for use with existing systems.

The Euro-Microbeeb can be attached to any type of computer for programming. The unit can then be run as a stand-alone micro. A wide range of inputs and outputs are present, with a real-time clock and battery-backed RAM. BBC Basic, Forth, Pascal, 6502 machine code and assembler are all supported.



Crammed with connectors

New AU staff

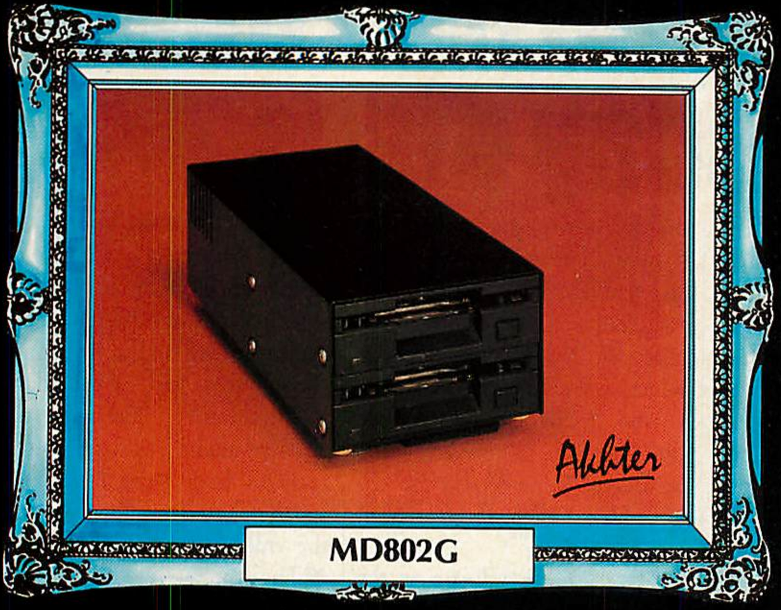
It's all change at *Acorn User*. Bruce Smith has been lured away to the bright lights of desktop publishing, and two new people have joined.

Steve Mansfield has come in as Deputy Editor, putting together the news and reviews.

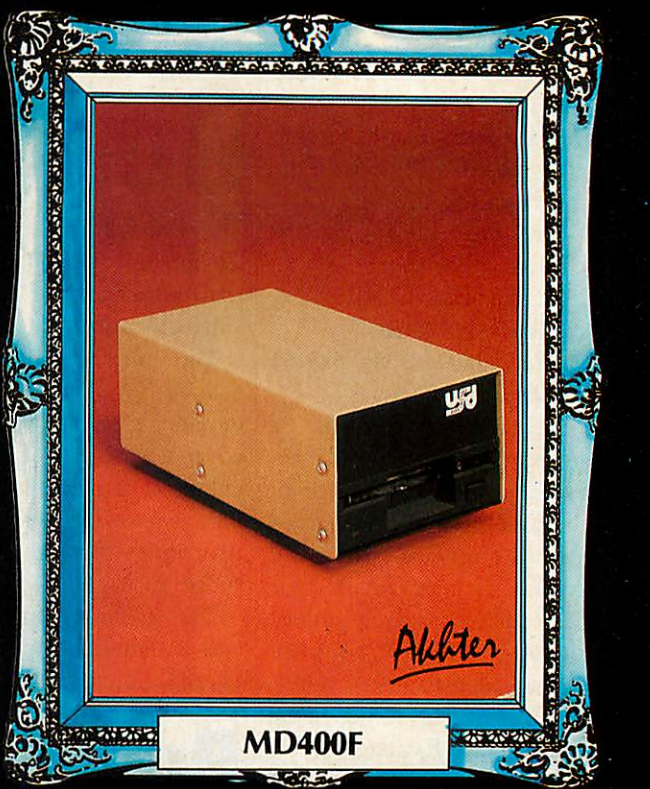
Graham Bell is *AU's* new Technical Editor, and will handle the listings, as well as look after Redwood's Econet.

Fortunately, Bruce hasn't severed all ties with the magazine. He will still be writing for *Acorn User*.

Master Series...

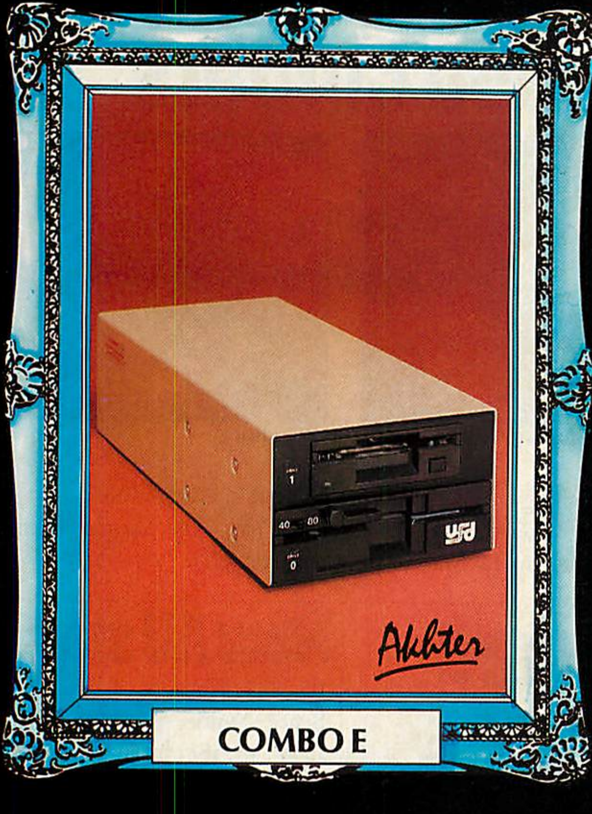


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COMBO E	3½+5¼ Floppy in Dual Format+P.S.U.	
COMPACT 5¼ SINGLE	Master Compact with internally fitted single 5¼ floppy. †	£499.95
COMPACT 5¼ DUAL	Master Compact with internally fitted dual 5¼ floppy. †	£639.95
†No monitor supplied.		

All prices include V.A.T.

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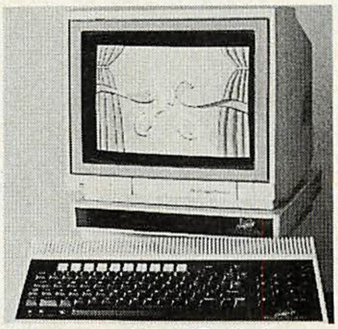
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100,000 Masters sold

Acorn claims to have sold over 100,000 Masters, a large proportion abroad.

In Hong Kong, 700 Master 128s are to be distributed between 55 schools and five teacher training colleges. Acorn's general manager in Hong Kong, Martin Riley, claimed that the colony's government went for the BBC micro because of the large amount of available educational software. Other factors were said to be price and Acorn's technical support and servicing.

Four schools' contracts have now been awarded by the Hong Kong government, with Acorn winning the last two. Atari, Apple and IBM also competed.



Rebadged as Olivetti Prodest

Another major deal has been signed by the West Glamorgan local education authority, which has ordered 500 Compacts from Swansea-based dealer Bucon. The machines are to be fitted with Mertec Compact Companion interface boards.

The deal is worth about £300,000 and follows a £250,000 order from the authority last year for Econet systems.

At the Compact launch last September, sales of the Master 128 were put at 30,000 by Acorn, so the new figure marks a dramatic increase, although UK sales of the Compact were thought to be disappointing.

Acorn would not release a breakdown but it's widely believed that Compacts account for around half. The majority of Compact sales have been overseas – mainly to Olivetti in Italy.

Viewdata rival for Prestel

Prestel is about to get a run for its money with the launch of a new online service.

The system, Epnitex, is being run by the people who produced the Timefame section on Prestel: the two parted company following a dispute over the type of information Timefame was allowed to provide.

Like Prestel, Epnitex is designed to be a carrier service, with independent information providers (IPs) putting up the pages. It's aimed mainly at business, although there are bulletin board pages and chat facilities for private users.

Although accessible using standard viewdata software, Epnitex claims a number of improvements over Prestel, in particular improved graphics facilities, and dynamic and special effects frames being available free to IPs. Pages can also be updated in real time. Companies will be able to set up closed user groups – for their customers or dealers, for example.

The electronic mail is claimed to better Prestel's, with word-processing, advanced graphics such as mixing text and graphics, and graphic character editing.

The system is still on test. Its founder, Roy Norman, said he wants it 'to be perfect before we start', but says he has already had interest from several possible major IPs. It is hoped the system will be online by the summer, with nationwide local call rates.

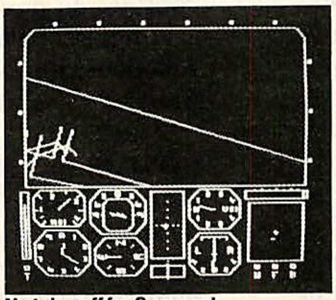
Compact Aviator dropped

In spite of the *Aviator* simulator being featured in Acorn's original list of software 'to be released soon' for the Compact on 3.5-inch disc, Acornsoft said that it is now very unlikely that it would appear in that format.

Reasons given include possible technical problems, but author Geoffrey Crammond insisted that the program is 'legal' and should run.
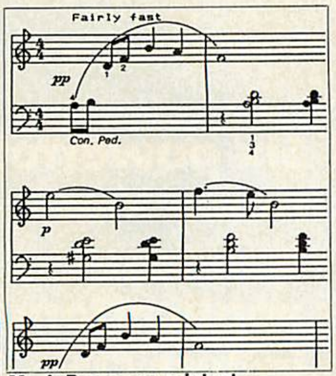
Acorn also claimed it was 'out of contact' with Crammond. Perhaps this is because he is now doing work for Firebird.

So the most likely cause is Acorn's third reason: that it simply wouldn't sell a worthwhile number of copies.



No take-off for Compact

Another product that never made it is the *Beginning BCPL with the BBC Micro* book, mentioned in an Acorn catalogue and the BCPL User Guide. Apparently the book's author 'went missing'.



Music Processor printout

Better print from music

Mid Sussex Software, which specialises in music products for education, has updated its transcription software for putting music on to paper.

The *Music Processor* package, launched last June, is a set of linked programs for entering, editing and printing music scores. It has already been used extensively in education.

Version Two has new features including automatic layout, a copy facility for repeated bars and sections, extract files and single part playback. It should be available in March. Another update is planned for September using memory overlay techniques with playback for up to three parts.

The price of the package is £49.95, but existing *Music Processor* owners can upgrade to Version Two for £6.

News in brief

- Creative Sparks is moving into full-price software. Already known for its Sparklers and Super Sparklers budget labels, the company has now added the Status Software name. The new label will concentrate on the quality games market.
- Budget software firm Mastertronic has bought Melbourne House, known for *The Hobbit* and *Way of the Exploding Fist*. Melbourne House will continue and will, the new owner says, release around 14 titles in 1987.

AU on show

Acorn User will be at the Electron and BBC Micro User Show in the Renold Building, UMIST, Sackville Street, Manchester on March 20-22. We'll be upstairs, on stand 20, with reduced price discs, binders and software, plus special subscription offers. Why not drop in?

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SEND TO: **Database Software, 36 St Petersgate, Stockport SK1 1HL. Tel: 061-480 0171.**

AU4

News in Brief

- The Institute of Opthalmology has been studying diabetes by examining the size of cells and blood vessels in the eye with a BBC micro and Grafpad. The specially-developed *Digit* software costs £70. Contact Dr B P Hayes, Institute of Opthalmology, Judd Street, London WC1H 9QS.
- For code breakers with micros, the American Cryptogram Association has started publishing a computer supplement to its magazine. The Treasurer of the ACA is at 12317 Dalewood Drive, Wheaton, Maryland 20902, USA.
- A speed of 115 lines per minute (480 cps) is claimed for Brother's 4018 heavy duty 18-pin printer. It can also run at 150 cps in NLQ mode. Also new is the HR-40 40cps daisywheel machine with a noise level of only 55dB.
- The newly-formed Association for Computing in Art and Design Education, ACADE, has sections for primary, secondary and further education and groups for particular subject areas. Individual membership is £10 including newsletter and local meetings.

Contact Nigel Johnson, Gray's School of Art, Garthdee Road, Aberdeen A89 2QD.

Run your own board

Several new communications software packages have appeared, including two for people who want to run their own bulletin boards.

NBBS Plus is an update of the successful bulletin board host software. The main addition is that it now handles viewdata protocols as well as the previous scrolling format. For those of you with modems, a demonstration is available on (0992) 552188. Price is £50.

If dial-up access isn't needed, the Electronic Tourist Board has released an educational version of its viewdata database software. The *KIDS* package has most of the features of an online system, like Prestel, but is designed to use in a closed system - in a school, for example. The ROM based software starts at £30.



Finally, Beebug has released a general purpose communications ROM called *Command* which provides 50 commands allowing you to build a customised communications system. The ROM supports auto-dial and auto-answer modes, various types of file transfer and works in both viewdata and text modes. It costs £39.

Blunderbox

Nothing too major this time. To run the *Kiddie Art* program (January 1987 issue) on a Compact, the following changes are necessary:

```
130 *FX4,2
180 *FX225,3
190 *FX226,3
240 K%=GET-1:Z%=TIME
280 IF K%=82 PROCsv
290 IF K%=75 PROCld
```

This disables the cursor keys — they can't be used to move the shapes around, but the function keys f2 to f5 can still be used for this purpose.

There was a minor problem in the March Hints and Tips Section. On page 47, in the Quick Fire corner, a vertical bar character was missed out. It should read: 'eg,¦N for Ctrl-N and so on'.

Valiant turtle boost

Valiant is to release a series of 20 worksheets for teachers on the use of Logo with the company's infra-red turtle.

Three are already available covering geometry and arithmetic, and the 17 underway tackle a variety of topics in art, craft, geography, science and technology.

Gill Manvell of Valiant said the worksheets could be used through primary and into secondary classrooms. Another development is the control of a turtle directly from a Concept Keyboard. Nursery school software is also planned.

In an effort to keep costs down the company charges £5 (cheque with order) for the first, and £1-£2 for each subsequent title. Valiant is at 370 York Road, London SW18.

Contacts

The news desk at Acorn User can now be contacted via Telecom Gold. Send your information to 81:RED001.

Acorn Computers: Cambridge Technopark, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411.

Advanced Computer Products: 6 Ava House, High Street, Chobham, Surrey GU24 8LZ. Tel: (0276) 76545.

Beebug: Dolphin Place, Holywell Hill, St Albans, Herts AL1 1EX. Tel: (0727) 40303.

Cambridge Microprocessor Systems: Brookfield Business Centre, Twentypence Road, Cottenham, Cambridge CB4 4PS.

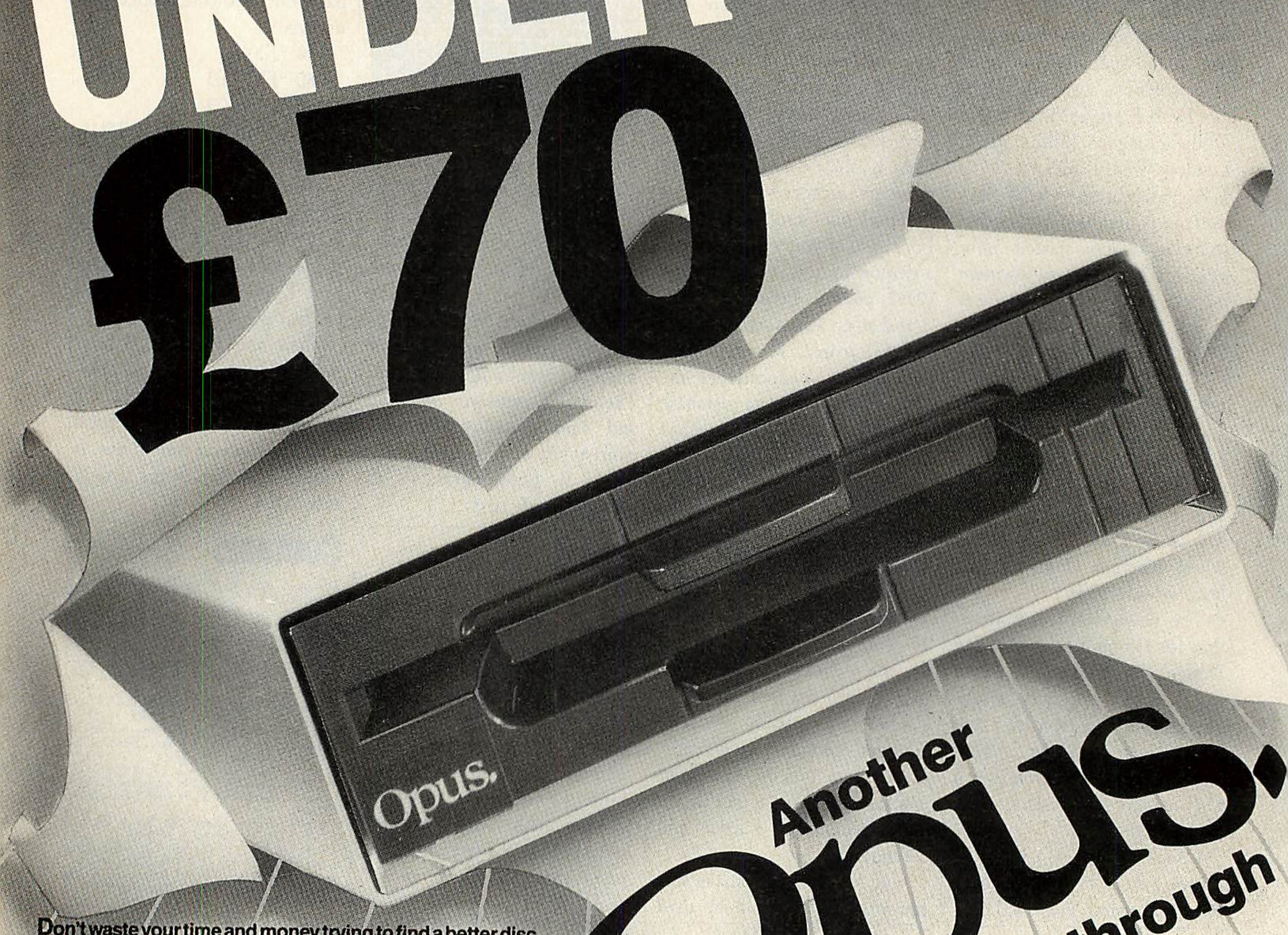
Creative Sparks: Unit B11, Armstrong Mall, Southwood Summit Centre, Southwood, Farnborough, Hampshire GU14 ONP. Tel: (0252) 522200.

Electronic Tourist Board: PO Box 4, Brecon, Powys LD3 7JS. Tel: (0874) 730692.

Linear Grahpics: 28 Purdeys Way, Rochford, Essex SS4 1NE. Tel: (0702) 541664/5.

Saturn Computers: Flat 1, 12 Avenue Road, Darlaston, West Midlands WS10 8AR. Tel: 021-526 6216.

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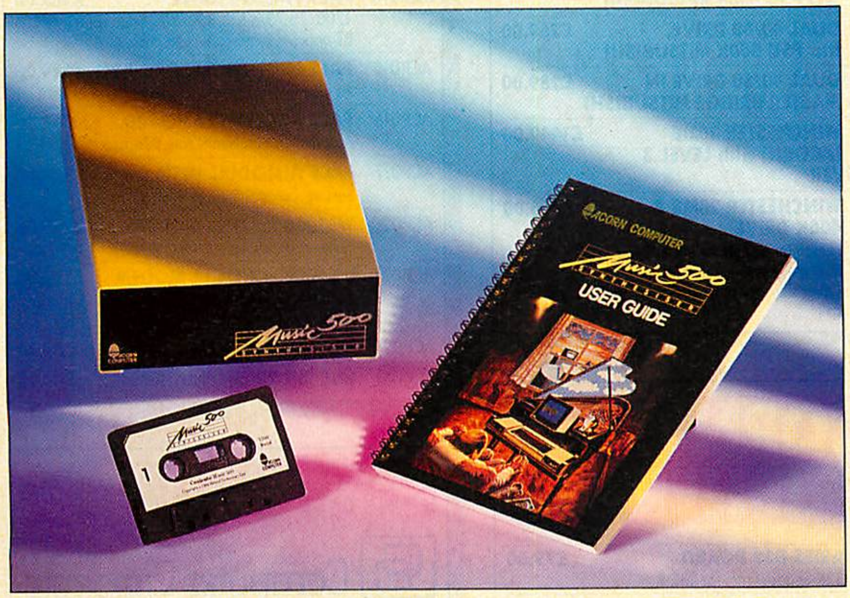
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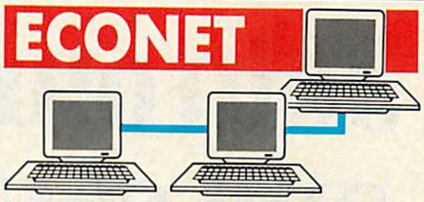
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ACH013	**BBC B 32K inc. ACORN DFS** Industry's favourite machine! Stocks available from time to time, please call	**£329.00**
ACH014	**BBC B+ 128K** Stocks available from time to time please call	**£365.00**
ACH015	**1770 DFS KIT for BBC B** Allows BBC to access disc drives Allows you to use ADFS as well	**£41.00**
ACH016	**ADFS ROM for 1770 or BBC B+** Gives 720K per disc	**£24.00**
ACH017	**64K UPGRADE KIT for the BBC B+** Upgrade your BBC B+ to 128K	**£27.00**
ACH018	**6502 2nd PROCESSOR** Compatible with BBC B, B+ and the Master with 64K ram and high basic	**£189.00**
ACH019	**Z80 2nd PROCESSOR** Complete with 64K CPM Complete with vast range of business software	**£319.00**
ACH020	**32016 CO-PROCESSOR** 32 bit processor Complete with Fortran, Pascal, Cambridge Lisp, C Basic and 32016 assembler	**£999.00**
ACH021	**ACORN CAMBRIDGE WORK STATION** 4MB work station with 32016 co-processor	**£3400.00**
ACH023	**TELETEXT RECEIVER**	**£94.00**
ACH024	**IEEE INTERFACE**	**£269.00**
ACH033	**2MHZ BUS INTERFACE** For Master Compact computers Allows you to connect Music Synthesisers and hard disc systems Simple plug-in cartridge	**£29.95**
ACH034	**ACORN MUSIC 500 SYNTHESISER** The old synthesiser going strong Ideal for presents!!	**£49.00**
ACH035	**MUSIC 5000 SYNTHESISER** Compatible with BBC B, B+ and Master Very user friendly with pull down menus	**£140.00**
ACH038	**MUSIC 5000 DEMO CASSETTE**	**£2.95**

All prices are exclusive of VAT.

ECONET



ACH006	**ECONET BBC MASTER ET 128** No DFS Econet station with 128K memory	**£300.00**
ACH007	**ECONET KIT** Upgrades for BBC B or BBC B+	**£55.00**
ACH008	**ECONET STARTER KIT**	**£79.00**
ACH009	**ECONET SOCKET KIT**	**£29.00**
ACH010	**ECONET MODULE** Upgrade cartridge for Master 128	**£43.00**
ACH022	**ECONET 10 STATION LEAD SET**	**£25.00**
ACP006	**PRINTER SERVER EPROM** Allows BBC machine to be a printer server station	**£39.00**

DISC DRIVES

AKHTER

All Peartree Disc Drives have a two year warranty by Akhter Computers

ACH026	**SINGLE 40/80 DRIVE, NO PSU 400K MITSUBISHI**	**£119.00**
ACH027	**SINGLE 40/80 DRIVE inc. PSU 400K MITSUBISHI**	**£135.00**
ACH028	**DUAL 40/80 DRIVE, NO PSU 800K MITSUBISHI**	**£229.00**
ACH029	**DUAL 40/80 DRIVE, inc. PSU 800K MITSUBISHI**	**£269.00**
ACH030	**DUAL 40/80 DRIVE IN MASTER BRIDGE MITSUBISHI**	**£289.00**
ACH031	**WINCHESTER 30MB (ACORN) with LEVEL 3 FILE SERVER**	**£1449.00**
ACH032	**WINCHESTER 20MB & 400K DRIVE** In monitor bridge for Master Built in fan and power supply Other sizes for hard discs are available, please call	**£766.00**

ACORN PERIPHERALS

ACH037	**ARIES B32 BOARD** 32K Shadow ram for BBC B	**£79.00**
ACP003	**MEGAMOUSE** High quality UK manufactured Fully AMX compatible	**£49.00**
ACP004	**WATFORD VIDEO DIGITISER** Use this superb digitiser by turning your favourite photographs into BBC's graphic mode, colour or monochrome	**£99.00**
ACP005	**MAGAZINE MAKER** Watford video digitiser and AMX page maker. Please state when ordering for Master or BBC B	**£139.00**

COMPONENTS

ACP007	**EPROM 27256 32K** 32K eprom	**£4.95**
ACP008	**EPROM 27128 16K** 16K eprom	**£2.95**
ACP009	**EPROM 2764 8K** 8K eprom	**£2.75**
ACP010	**8K RAM CHIP** Low power ram chips used in sideways rams	**£2.50**
ACP012	**EPROM ERASER WITH TIMER**	**£29.95**
ACP013	**EPROM BLOWER** Will program 2764, 27128, 27256 and 27513	**£69.00**
ACP023	**ACORN BBC B KEYBOARD**	**£49.00**
ACP025	**ACORN UHF MODULATOR**	**£5.95**
ACP026	**ACORN 8271 DISC CONTROLLER**	**£39.00**
ACP027	**ACORN 8271 AND TTL** Complete DFS kit	**£49.00**
ACP028	**BBC B+ AND BBC B IBM LOOKALIKE CASE**	**£99.00**
ACP032	**ZEP 100 TORCH CPM FOR BBC 64K CPM TORCH**	**£199.00**
ACP033	**BBC MASTER DUST COVER**	**£4.50**
ACP034	**BBC B DUST COVER**	**£4.50**
ACP035	**BBC MASTER COMPACT DUST COVER**	**£7.50**

MODEMS



ACP014	**PACE NIGHTINGALE** 1200/75 75/1200 300/300 baud rates BT approved complete with cables	**£109.00**
ACP015	**PACE NIGHTINGALE COMBO** As above with Comstar software	**£129.00**
ACP016	**PACE ACCESSORY BOARD** Autodialler, autoboard rate selection	**£42.00**
ACP017	**PACE AUTODIAL DISK** Sets up Comstar for autodial	**£9.00**
ACP020	**WS3000V21/V23 MODEM** Hayes compatible	**£285.00**
ACP021	**WS4000 SCHOOLS MODEM** Autodial, autoanswer Schools approved	**£159.00**
ACP029	**VOYAGER MODEM**	**£59.00**
ACP031	**BBC MICRO VIEWDATA**	**£49.00**

SOFTWARE

Computer Concepts

ACS002	**WORDWISE PLUS** Mode 7 editing, preview in mode 0 Multi document editing	**£45.00**
ACS003	**INTER SHEET** 40, 80 and 105 column mode multiple spreadsheet	**£42.00**
ACS004	**INTER CHART** Built in Epson screen dump Supports pie, line and bar charts	**£30.00**

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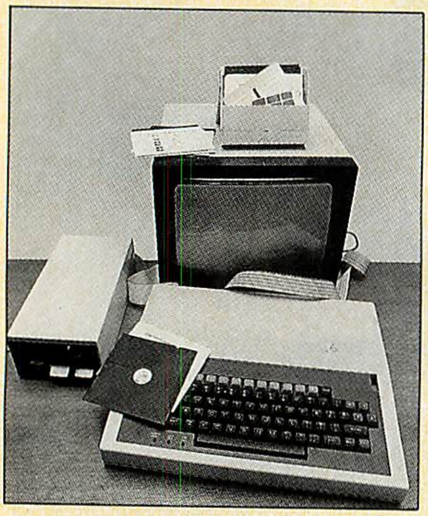
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PEARTREE COMPUTERS LTD

Acorn
The choice of experience.

Peartree House, No 1 Blackstone Road, Stukeley Meadows Industrial Estate, Huntingdon, Cambs PE18 6EF. Telephone (0480) 50595

A new upgrade from Peartree- give your BBC the PC look.





If you're tired of having your BBC peripherals strewn over your desk, this neat unit will tidy them into a professional package—it even includes an IBM® look-a-like keyboard and a built-in 80mm fan. It's easy to fit (with full instructions supplied) and the necessary connections are on the back of the case.
The complete package costs

only £99.00
+ carriage and VAT

total price **£124.20** ▶**PEP013**

PLEASE USE OUR CODES WHEN ORDERING

All prices are exclusive of VAT.

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Viglen Viglen

SYSTEMS



COMPLETE SYSTEMS FROM VIGLEN

The following systems come complete with the BBC Master and drives fitted in the Viglen Master Console unit.

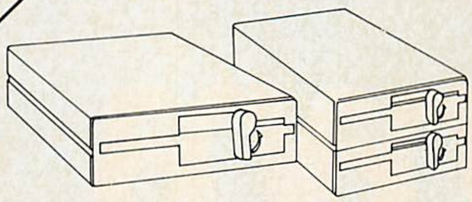
Stock Code	Description	Price inc. VAT
V250	Viglen Master System 1 This system includes: BBC Master128K in Console unit Single 400K (760K double density) 40/80 disc drive. Philips BM7502 Hi Res Green Screen Monitor	£699.00
V251	Viglen Master System 2 This system includes: BBC Master 128K in Console unit Dual 800K (1520K double density) 40/80 disc drive Microvitec standard Res. colour Monitor.	£949.00

Other systems can be tailor made for your requirements, 3½" drive can be supplied instead of 5¼" at the same price. Please call.
To complete the system you only need to add a printer from any of the range. The current special offer printer that's particularly suited to the packages is the Centronics GLP at £119.95 inc. VAT.
Please add £12.00 for insured courier delivery.

DISC DRIVES

FROM £99 inc. VAT

The finest Japanese disc drives (not Taiwanese immitations) available at the lowest prices.



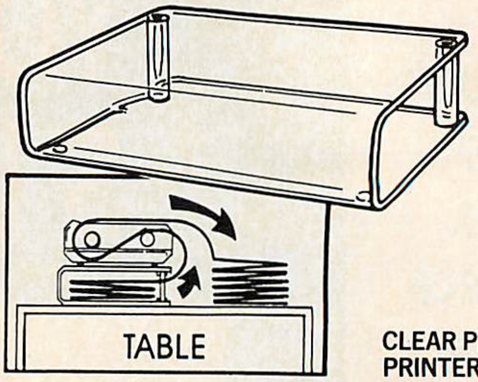
Items marked ☆ are special offer products.

All disc drives are supplied with a manual, packed utilities disc and a full 12 Months warranty (2 Year Warranty available) and are ready to plug in and use on a BBC B (fitted with a DFS) B + or Master micro. 40/80 Track drives have a switch which enables operation in either 40 or 80 track mode.
The capacities quoted are given in single density mode; for double density mode (1770 DFS + ADFS as in the Master) the capacities should be approximately doubled.
An integral power supply is not necessary as the disc drives run from the micro's power source however should you require drives with their own power supply, these are also available.
If your BBC B micro does not have a DFS fitted then you will also require the Acorn dfs kit.

Stock Code	Description	Price inc. VAT
SP014☆	Single 400K Viglen 40/80T Drive	£99.00
SP019☆	Dual 800K Viglen 40/80T Drive	£189.00
V001	Single 100K Viglen 40T Drive	£99.95
V031	Single 100K Viglen 40T Drive + PSU	£119.95
V004	Single 400K Viglen 40/80T Drive	£124.95
V035	Single 400K Viglen 40/80T Drive + PSU	£144.95
V008	Dual 800K Viglen 40/80T Drive	£234.95
V038	Dual 800K Viglen 40/80T Drive + PSU	£279.95
V064	3.5 and 5.25 inch Drives in dual case with Power Supply	£263.95
V062	Single 3.5" 400K Drive + PSU	£129.95
V063	Dual 3.5" 800K Drive + PSU	£229.95
V502	1770 or 1.2 DNFS Kit	£49.95
V503	Acorn ADFS Rom	£29.95

Please add £8.00 for insured courier delivery.

PRINTER STANDS



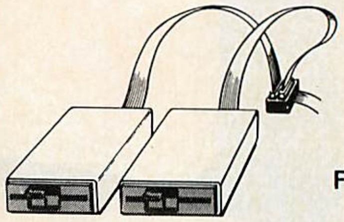
CLEAR PERSPEX PRINTER STAND

The Viglen printer stands are beautifully finished in clear perspex and raise the printer high enough to put continuous stationary underneath.

Stock Code	Description	Price inc. VAT
V490	80 Column Printer Stand (15" × 13" × 3.5")	£19.95
V491	136 Column Printer Stand (23.5" × 13" × 3.5")	£29.95

Please add £3 P & P

DUCKS



DUAL DRIVES FOR LESS THAN £17!

The Viglen Data DUCK (Dualling Up Connector Kit) converts any two single drives to a dual drive instantly. Simply plug the duck into the micro's disc drive socket and plug two single drives (any type and any make) into the duck to obtain a dual drive system accessed as drive 0 (and 2 if double sided) and drive 1 (and 3 if double sided). If neither single drive has its own power supply then you will require a Viglen power DUCK in order to obtain two disc drive power sockets from the micro.

★ No soldering simply plugs in.
★ No need to take disc drives apart to change links.

Stock Code	Description	Price inc. VAT
V084	Viglen data duck	£16.95
V085	Viglen power duck	£7.95

Please add £2.50 for P & P.

PRINTERS



GREAT VALUE PRINTERS

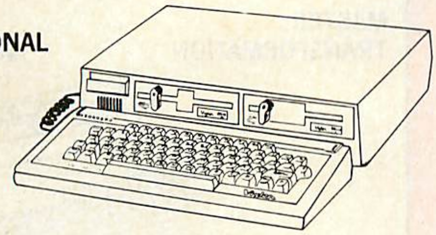
Stock Code	Description	Price inc. VAT
Dot Matrix Printers		
V410	Canon PW1080A/TaxanKP810	£259.00
V409	Centronics GLP	See Special Offer Box
V420	Epson LX86 with tractor feed	£269.00
V421	Epson FX800	£379.00
V422	Epson LQ800 (200 cps)	£559.00
Daisywheel Letter quality printers		
V400	Juki 6100	£279.00
Ribbons		
V462	Canon PW1080A/Taxan KP810 ribbon	£5.95
V463	Epson MX80/RX80/FX80/FX85 ribbon	£5.95
V464	Centronics GLP ribbon	£3.95
Printer cables		
V495	BBC micro/ Master printer cable	£7.95
V497	Master Compact printer cable	£7.95

Please add £8.00 for insured courier delivery and £1.50 for ribbon.

THE VIGLEN RANGE

BBC CONSOLE UNIT

VIGLEN PROFESSIONAL CONSOLE UNIT

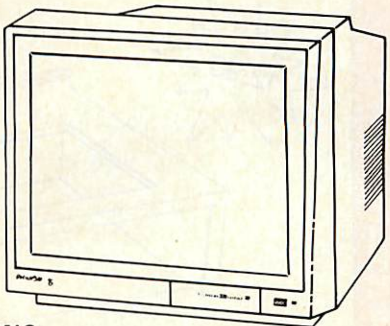


Your BBC micro can be given the professional PC-look by replacing your existing lid with this smartly styled package which can house two disc drives, the Viglen Rom cartridge system, most internal boards and can support monitors including 14" television sets.
PCU Package includes: Keyboard case, Metal screened main unit, casing including internal fittings, 2 meter coiled cable to connect main unit to keyboard, blanking plates to blank out disc drive apertures, Keyboard label.
Other accessories are also available including units fitted with single or dual drives.

Stock Code	Description	Price inc. VAT
V851	Viglen Professional Console unit for the BBC micro (PCU)	£49.95
Accessories for the Professional Console unit		
V852	2 Meter coil cable on its own	£14.95
V853	Dual drive data cable for console unit	£9.95
V854	Dual drive power cable for console unit	£5.95
V855	Power supply for PCU (capable of running two 1/2 height drives)	£32.95
V856	Fan kit for PCU (only necessary if your BBC normally gets extremely hot)	£34.95
V857	Extension keyboard on its own including coiled cable.	£29.95
V858	Fitting bracket for 3½" drive	£8.95
	Fitting service available from	£15.00

Please add £6.00 for courier insured delivery.

MONITORS



COLOUR & MONO

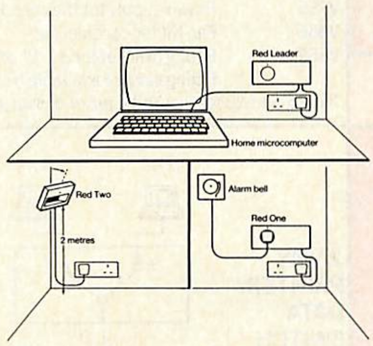
All the following monitors are supplied with a cable to fit the BBC micro/ Master and Compact.

Stock Code	Description	Price inc. VAT
Monochrome Monitors		
V331	Philips BM7502 Hi Res Green	£85.00
V332	Philips BM7522 Hi Res Amber	£95.00
V333	Taxan KX1201 Hi Res Green	£89.00
Colour Monitors		
V300	Microvitec 1431 Std Res Colour Monitor	£229.00
V301	Microvitec 1451 Med Res Colour Monitor	£279.00
V304	Microvitec 1451APL Med Res Colour Monitor with PAL	£299.00
V302	Microvitec 1441 Hi Res Colour Monitor	£449.00
V356	Taxan Super Vision II	£349.00
V357	Taxan Super Vision III	£399.00

Please add £8.00 for insured courier delivery.

RED BOX

AS SEEN ON MICRO LIVE



VIGLEN RED BOXES

The Red Box system offers all home computer/pc owners the opportunity to run their own home control system. The Red Box starter system provides the first step to an almost endless string of possibilities, from time switching to security. Easy add-on options will give you the high-tec home of the future.
All Red Boxes are protected against interference, either malicious or accidental. Each device is assigned a unique, secret code, known only to the owner. All messages between devices are encoded with a secret key, making them even more secure.
All Red Box systems use powerful micro-processors; they are very easy to use and do not require any programming. Your computer controls the system by simple commands given to Red Leader through the keyboard.
The Red Box starter system comprises:

RED LEADER: a powerful micro Processor Controller Red BASIC programme language.
RED ONE: a computer controlled mains socket into which you plug the appliance to be controlled.
RED TWO: an infa-red sensor which automatically reports any movement to Red Leader.
RED BOX: home control at the touch of your micro.

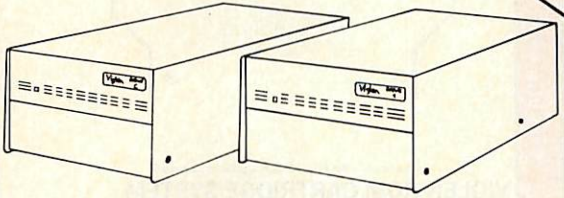
Stock Code		
V0899	Programmable Security Device	£129.95

Please add £6.00 for insured courier delivery.

WINCHESTERS

MEGA BYTES FOR MINI BUCKS

NEW LOW PRICES



Plug in 20 to 112 Megabytes of extra storage with the Viglen Winchester system.
The Viglen Winchester is ready to plug in and use on a BBC Master micro; for a BBC B or B plus you will merely need to fit the Acorn ADFS Rom. The Winchesters are 100% compatible with the Acorn Winchester and Acorn ADFS and will also work with the Acorn Master 512 board with DOS plus.
Drive 1 Winchesters are also available for backup or just more storage and simply plug into the back of the Drive 0 unit.
The Winchester package consists of: Winchester unit (cased with controller boards, power supply and fan), Master reference Manual part 1, Winchester user guide and Winchester utilities on disc (such as formatter, verifier, ADFS menu and sophisticated backup program allowing you to make fast backups on DFS discs, ADFS discs or Drive 1 Winchester.)

Stock Code	Description	Price inc. VAT
Drive 0 Single		
V150	VB20 20Meg Viglen Winchester	£699.00
V152	VB28 28Meg Viglen Winchester	£759.00
V155	VB40 40Meg Viglen Winchester	£1045.95
V156	VB56 56Meg Viglen Winchester	£1119.95
Drive 1 Second Drive		
V160	VB120 20Meg Drive 1 Winchester	£599.00
V162	VB128 28Meg Drive 1 Winchester	£649.00
V165	VB140 40Meg Drive 1 Winchester	£819.95
V167	VB156 56Meg Drive 1 Winchester	£899.95
V503	Acorn ADFS Rom and Manual (Only necessary for BBC B or B Plus	£29.95

Please add £8 for insured courier delivery.

SEND OFF YOUR ORDER NOW!
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Viglen

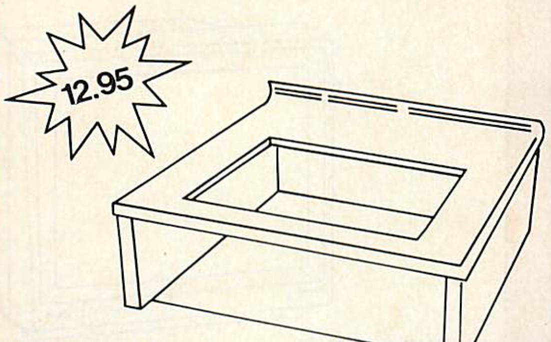
THE VIGLEN RANGE

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Viglen Viglen

PRINTER STANDS



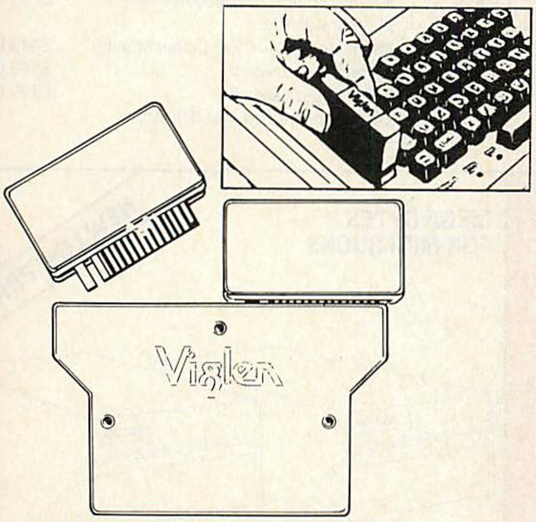
NEW LOW COST PRINTER STAND

The Viglen low cost 80 column printer stand is made in high impact ABS plastic colour matched to most printers. It raises the printer high enough to put continuous stationery (up to 1000 sheets) underneath.

Stock Code	Description	Price inc. VAT
V492	Viglen low cost 80 column printer stand (15" × 14" × 5")	£12.95

Please add £3.00 for postage and packing.

CARTRIDGE SYSTEM



VIGLEN ROM CARTRIDGE SYSTEM

Having fitted the Viglen Rom cartridge system to your BBC, Master or Master COMPACT, you can plug in your Roms/Eproms simply by inserting each one in a Viglen cartridge and plugging in whichever cartridge you want to use. The same Viglen cartridge can be used on all the micros mentioned and there is no need to switch the micro on and off between cartridge changes.

The Viglen cartridge system for the BBC micro consists of the cartridge cable assembly and socket, blanking off plates, 1 cartridge and cartridge storage rack. The cartridge socket when fitted protrudes from the rectangular slot on the left of the keyboard where the cartridges are subsequently inserted. It is simple to fit and requires no soldering.

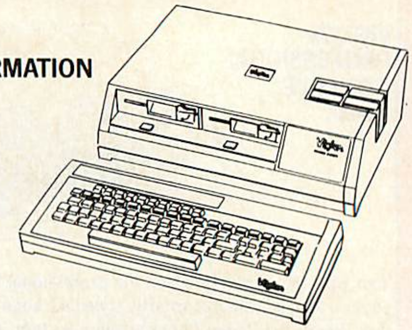
The Viglen cartridge system for the Master and Master COMPACT simply plugs into your Master cartridge slot (or COMPACT expansion port) and accepts two Viglen cartridges. On the Master you can plug in up to two Viglen cartridge systems thus giving you access to 4 Viglen Cartridges simultaneously. The system comes complete with 2 cartridges and cartridge storage rack. On the Master you can also use Viglen cartridges which have 32 and 64K paged Roms inserted.

Stock Code	Description	Price inc. VAT
V560	Viglen Rom cartridge system for BBC	£12.95
V559	Viglen Rom cartridge system for BBC (low profile)	£12.95
V550	Viglen Rom cartridge system for Master	£14.95
V551	Viglen Rom cartridge system for COMPACT	£14.95
V561	Single Viglen cartridge	£1.99

Please add £2.50 P & P (£00.50 for single cartridge).

CONSOLE SYSTEM

MASTER TRANSFORMATION



Give your BBC Master micro the professional PC look by replacing your existing lid with this smartly styled package. The system is strong and constructed in high impact ABS colour matched to the BBC Master and it gives your Master a very neat and impressive look.

- ★ Will support monitors including up to 16" TV.
- ★ Can house two 5 1/4" disc or Winchester drives.
- ★ Capable of housing 3 1/2" drives.
- ★ Will accept Acorn cartridges and the Viglen Master Cartridge system.
- ★ Full internal metal screening.
- ★ Also available with fitted drives (5 1/4", 3 1/2" or Winchester) or as a complete system including the Master.

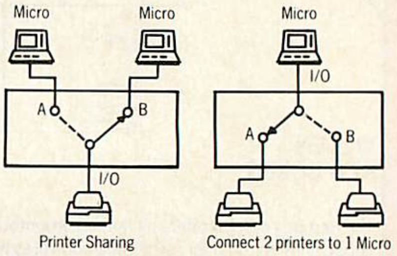
The Master console unit system package includes:
Remote keyboard case with cable.
Metal screened main unit casing including internal fittings for 5 1/4" drives.
Two switches which can be used for 40/80 track switching and can be either fitted on the front or rear of unit.
Two blanking plates to blank out any drive aperture that is not used.
Full labelling kit.
Fully illustrated fitting instructions.

Stock Code	Description	Price inc. VAT
V861	Viglen Master Console unit	£59.95
	Accessories for the Master Console unit	
V853	Dual Drive data cable for console unit	£9.95
V854	Dual Drive power cable for console unit	£7.95
V855	Power supply for the console unit	£34.95
V866	Fan Kit for console unit	£34.95
V858	Fitting bracket for 3 1/2" drive	£8.95
	Fitting service available from	£15.00

Please add £8 for insured courier delivery.

SWITCHES

2 WAY PRINTER/ DATA SWITCH



The Viglen 2 Way Printer/Data Switch allows you to connect two printers to one computer or two computers to one printer, and to switch between them. All lines are switched (unlike other models) and hence the switch can be used with a combination of any type of computer and printer (or modem, or terminal, or any other data product).

All sockets on the parallel switch are centronics 36 way, female type. Serial versions are also available with 25 way "D" type, female sockets.

★ Compact size 7³⁄₁₆" × 5" × 2". ★ Push Button Operation.

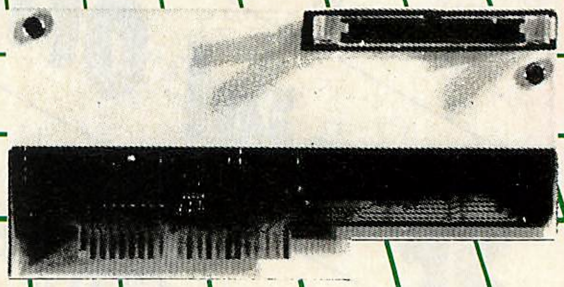
Stock Code	Description	Price inc. VAT
V2000	PAB2 Parallel 2 Way Printer/Data Switch	£49.95
V2001	SAB2 Serial 2 Way Printer/Data Switch	£59.95
CABLES		
V0493	36 Way Centronics to Centronics cable	£ 9.95
V0494	25 Way D Type Serial to Serial cable	£10.95
V0495	BBC to Centronics Cable	£ 8.00
V0496	BBC to 25 Way D Type Serial Cable	£ 8.95
V0498	IBM PC to Centronics Cable	£14.95
V0499	IBM PC to 25 Ways D Type Serial Cable	£10.95

Please add £2.50 for postage and packing.

Advanced Computer Products

THE ADVANCED PLUS FOUR

"Disc drive compatibility at long last".
ELECTRON USER, JUNE '86



The Advanced Plus Four (A.P.4.)

- A FULLY ACORN COMPATIBLE disc I/face for the 'ELK' & Plus 1
- Accepts any standard 5¼" or 3½" disc drive with PSU
- Supplied with 1770 DFS (as supplied on the B+ & Master series) (A.E.D. is still available for Plus 3 users at £24.15 inc.)
- Page stays at &E00, the same at Tape F.S. NO LOSS of RAM
- Will allow more tape software to be run from disc
- Access compatible BBC disc-based software. No conversion program needed
- Extra sideways ROM socket fitted as standard
- A self-contained, well finished and fully tested product
- No 'short cuts' in design, finish or components
- ROM s/ware includes format, verify, free space and utils.
- Achieve greater BBC compatibilty

£69.55 (+VAT)

"I can recommend it to anyone contemplating upgrading to disc".
Electron User, June '86

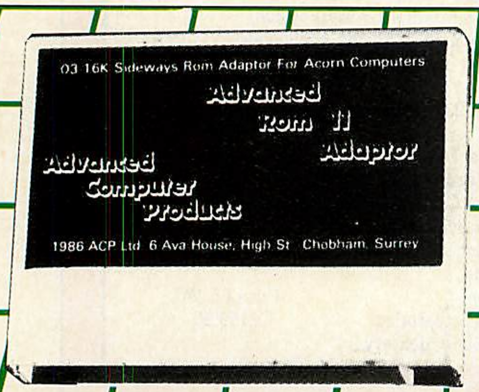
"The AP4 should be considered the standard interface for the Electron".
Acorn User, July '86

AP4 SPECIAL PACKAGE PRICES

AP4 100 = AP4 + 5¼" 40 track S/S including PSU **£199.00**
AP4 400 = AP4 + 5¼" track switchable D/S including PSU **£229.00**

These prices include VAT and delivery

THE ADVANCED ROM ADAPTOR II



The Advanced ROM Adaptor II

Our versatile cartridge continues to grow in popularity and demand. This ROM/EPROM adaptor is a quality product fully enclosed in an Acorn approved casing, providing full protection for your valuable firmware! A.R.A. 2 not only allows 8K (2764) & 16K (27128) ROMS/EPROMS but also supports 27513 & 27011 devices (when used with the correct software) for which we are currently devoloping new products. Fully compatible with the Master Computer & Electron Plus 1 "The best ROM cartridge is by far the ACP ARA2", A+B Dec 86

ADVANCED PRINT BUFFER — (5¼ ADFS) / B / M / C / £5.95

Is a program that runs in sideways RAM and provides a large Print Buffer, instead of the resident 63 bytes. Large means over 14K (14700 characters) allowing letters, reports, documents, listings, etc. to be printed while you carry on with naother task. Full control is provided to switch Buffer on/off. Purge Buffer, even changing the effect <ESCAPE> has on the Buffer (essential when using w/procs such as View)

ADVANCE BBC DFS Eøø — (5¼ DFS) / B+ £19.99

Enables B+ or upgraded B users to run 1770 DFS at Eøø when used in 16K sideways RAM

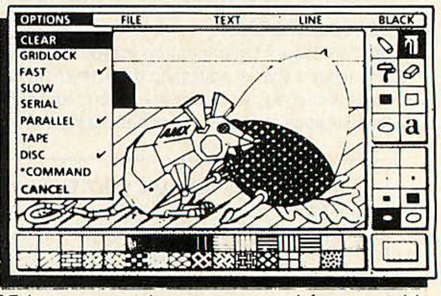
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AMX PACKAGE

Plug the MOUSE into the user port, and the EPROM into your A.P.5. The latter contains fast machine code routines for creating on-screen windows, icons and pointers. And means that the MOUSE buttons can be programmed for use with commercial software such as Wordwise and View. There are two manuals included, explaining how to operate the MOUSE and the ROM routines, which are available in both basic and machine code programs.

Included in the package are two superb programs:

AMX ART has to be seen to be believed! It's a computer-aided drawing program that's just as good for serious applications - such as the preparation of detailed architectural and engineering drawings or teachers' worksheets - as it is for having lots of family fun! And if you're artistically inclined, you'll be astonished at the quality of work you can produce and save. It makes full use of on-screen menus, pull-down menus and icons: the ideal, easy way for novices to learn and gain in confidence.

ICON DESIGNER is an invaluable program for creating and storing icons for use in your OWN programs.

The ACP/AMX mouse package may be used on an ELECTRON fitted with a PLUS I & AP5. The 'ART' software is supplied on cassette but can be transferred to DISC (DFS not ADFS)

£69.95 – MOUSE PACKAGE AND AP5 £125.00

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LETTERS

Write to Letters, Acorn User, 141-143 Drury Lane, London WC2B 5TF

SURVEYING THE SCENE

Sir, I read the letter referring to software for surveyors with interest. If the company concerned would care to contact me, I may well be able to help out. Please write to:

13 Carnoustie,
Home Farm,
Bracknell,
Berks.

If they could provide me with the calculations they have to make, I would be prepared to attempt to write the required software in either Basic or 6502 machine code.

On another note, Mike Rawlings' listing for Filing Sideways (Sept '86) was found to be very useful for a piece of scientific equipment colleagues and I are developing. The equipment will use a stand alone 6502 micro-processor and the problem was to allow software to auto-boot on switch-on.

I have written the main controller in Basic with some machine code sections for speed. Ideally, the whole lot should be written in machine code, set up as a language in ROM which could then be selected by default. However, since there is no problem (yet!) with 'no room' and speed is not essential in the Basic parts, it was decided not to re-write it.

Mike Rawlins' listing allows all the files to be loaded into sideways RAM. Auto-booting can be accomplished by adding the lines above.

Once the software is proved to auto-boot by pressing CTRL-Break, it may be assumed to function in ROM from so it may be 'blown' into an EPROM. On switch-on, all

```
2541 LDY #0
2542 .again TYA:PHA:LDA
auto+p%,Y:BEQ return
2543 TAY:LDA #&8A:LDX #
0:JSR &FFF4:PLA:TAY:INY:
JMP again+p%
2544 .auto
2545 ]
2546 PROCequs ("*ROM"):
PROCequb (13):PROCequs (
"CH.""BOOT"""):PROCequb
(13)
2547 PROCequb (0)
2548 [OPT pass
2549 .return PLA
```

the ROMs are initialised and the inserted code is placed into the input buffer. Once Basic is selected, usually by default, the command *ROM activates the ROM filing system and CH."BOOT" chains the file BOOT which should have been placed in the EPROM along with any other files.

I have to say that the idea came from David Acton's *Quadline* program (*Acorn User* Jan '85) listing 3.

J R Leighton
Berkshire

BEAM CALCULATIONS

Sir, I have written a beam calculation program which needed the extra memory of the 6502 second processor. What a coincidence, therefore, to read two letters in your December issue, the first entitled 'Second Thoughts' and the second, 'Software for Surveyors'.

The program which I was developing reached the point of producing shear force and bending moment diagrams from sets of calculations; these agreed well with manually performed calculations but the frustration of not being able to dump them to a printer resulted in an uncompleted program. I still have not been able to discover the means to produce the dump.

On the subject of software for surveyors, I have a very impressive printout, which runs to 12 sheets, on the analysis of a roof truss. I do not know if it runs on the BBC micro, indeed, if it is in Basic but for what it is worth, its name is *CADS3analyse (c) CADS 1983*. After inputting the relevant details, a mass of tables are produced, including forces and moments, reactions, and so on. And, finally, a diagram of the truss over which is superimposed the truss after loading, showing the deflections.

Bending moments of various members are also shown diagramatically on other sheets. Altogether, it gives a superbly clear picture of the complete framework under loading.

If I could have produced a program which only approached the quality of this, I should have been more than satisfied. Perhaps the secret of the dump from the screen across the 6502 will eventually come to light; my program will then no doubt be resurrected and completed.

R J Lindsell
Essex

Beamscan is a piece of software for calculating the deflections of steel and timber beams. It costs £50 or £60 (with graphics) from Beamscan, 20 Vaughan Ave, Hendon, London NW4 4HU. Please state BBC or Master and disc format (40 or 80-track, Acorn DFS).

Also, Acorn has a catalogue of technical software. It costs £2.50 from Vector Services, Unit 21, Ideal Complex, Victoria Rd, Wellingborough, Northants.

The answer to your prayer for dumping screens is _Acorn User's User Dump_ which comes in a ROM chip and costs £19.95 inclusive. It will work with any Epson-compatible printer (except the MX80).

If you are interested turn to page 130 for details.

HELP PLEASE

Sir, Would it be possible to use the pages of *Acorn User* to make an appeal?

We have a totally blind student who started his GCSE courses this September, and most of our software and hardware is unsuitable for him.

What we would like is if you could appeal for anyone who would be willing to write programs to help us. This would vary from the simple and short to the long and complex. In other words something for everyone. Could you ask people to contact me at: Kingsdale Comprehensive School, Alleyn Park, London SE21 8SQ.

Many thanks.

Graham Luckhurst
London SE21

Linnet - Designed to a philosophy

	Linnet	Others
V21/V23 operation (1200/75, 75/1200, 300/300)	✓	☐
1200/75 Speed buffering	✓	☐
Micro-processor control	✓	☐
Hayes compatible	✓	☐
Auto rate sensing	✓	☐
Auto-dial	✓	☐
Baud rate scanning	✓	☐
Internal number store (with battery back-up)	✓	☐
Call progress monitoring	✓	☐
Internal audio monitor	✓	☐
Auto repeat dial	✓	☐
Auto-answer	✓	☐
Tri-level configuration	✓	☐
Help menus	✓	☐
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All included in one low price	✓	✗

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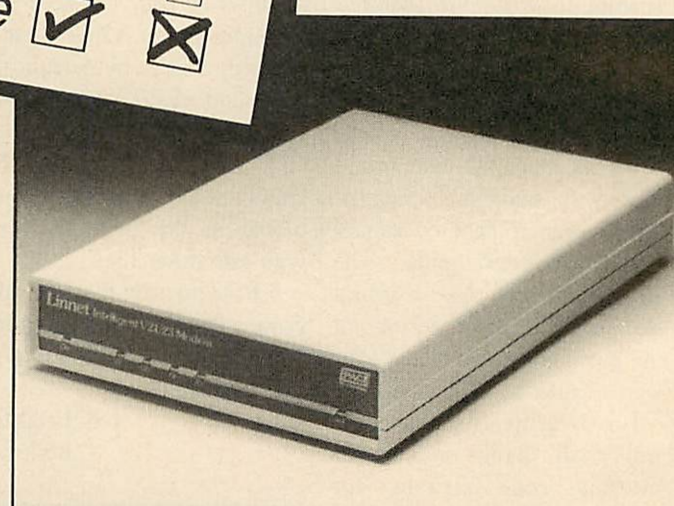
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Linnet is a truly remarkable modem, specifically designed to meet the needs of both the home, education and business user alike, at an affordable cost.

Linnet will auto dial or auto answer, it is Hayes compatible and uses an extended 'AT' command set. It will monitor the progress of the call both audibly via the built in speaker, indicating to the user that a connection is being made and on the screen with simple messages such as line busy etc. For those computers not able to handle split baud rates, Linnet will speed buffer from a terminal speed of 1200 baud to 1200/75, and will automatically detect the baud rate of the system being accessed.

Linnet features battery back-up and has a 32 number store facility. It comes with 'AT' commands and 'S' registers pre set but these can be reconfigured to suit the needs of the user, and retained in memory.

Three built-in help menus make Linnet simple to use and its range of features make it one of the most advanced modems available.



On some modems around today, many of the above features are charged for in 'addition' to the basic price. Linnet provides these in an inclusive package which includes a detailed user guide. In short Linnet provides a simple cost effective solution to your communications needs.

Linnet — because not all modems are created equal.

For further information on Linnet or on the complete range of Pace Modems (up to V22 bis intelligent operation) contact your local dealer.

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Prestel Mailbox No. 274 729306 Telecom Gold Mailbox No. 79:PCE001 Int. Tel. No. +44274488211

MORE SURVEYING INFO

Sir, I write in replay to Peter Thatcher's letter (*AU*, December 1986) enquiring after software and surveyors. Although I am a 'converted' reader from – dare I say it – *Micro User*, I noticed an article in the September 1986 edition of *MU* that might be of assistance to Mr Thatcher. The article in question is entitled 'Surveying the scene with the BBC micro', and I have no doubt that this particular subject will make interesting reading for him.

May I take this opportunity of congratulating your editorial staff on the excellent content of *AU* – keep it up!

Steve Chadderton
Lancashire

ADVENTUROUS UPGRADE

Sir, I've had my model B micro for two years now, and I have tried many times writing an adventure game, but can't manage it. Now I wonder if *Acorn User* might produce a series about writing adventures on the BBC micro.

I'm now going to upgrade to DFS but there are so many to choose between! Which one do you think is best for me? I'm 14 years old and I'm working with many small programs, so I need a DFS that can take more than 31 files. Can you give me some help?

Robert Schmidf
Norway

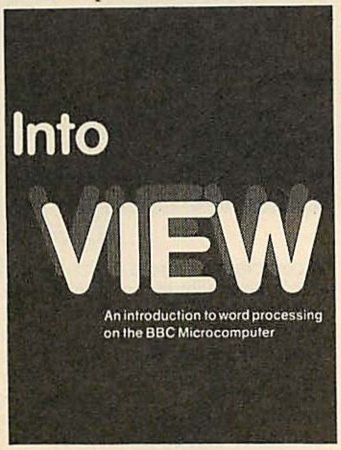
Writing adventures is a difficult subject to cover in a magazine, but Joe Telford wrote an *Acorn User Adventure* in the July 1985 issue. There are several books on the subject, some of which have been reviewed in past issues.

As for the DFS, if more than 31 files per disc is your main need, then Watford Electronics' DFS will do the job, and is very similar in use to Acorn's (make sure you get the latest version for maximum software compatibility).

The July 1985 and 1986 back issues carried special sections on upgrading to disc. Copies of *Acorn User* are available using the order form on page 136.

VIEW LINE COUNTS

Sir, *View* must be one of the most widely used word-processors – an efficient and easy to use WYSIWYG. However, printing is restricted to standard format. So one of the minor mysteries is why Acorn did not provide a suitable and



necessary line counter. Adjusting text to conveniently fit the page is a recurring pain in the neck. Without this information one can end up with too many or too few lines for a satisfactory page presentation. The only way seems to be a visual count, including the headers and footers etc. The line length can then easily be adjusted to fit the page. The number of words is almost irrelevant.

It must be admitted, though, that the use of *Fontwise* typefaces and micro-spacing can upset calculations of both line length and line count.

One can live with the multitude of essential codes etc, but does someone know how to quickly and effectively arrive at the number of lines – a facility so thoughtfully provided by some of the competition? Perhaps I am a unique operator as I have seen no comment relating to this deficiency.

Maurice Gordon-Edgley
Portugal

Z80 AND THE MASTER

Sir, In the pre-launch publicity material on the Master, one section outlined the expansion potential. This, of course, speaks for itself. However I was interested in the point regarding the connection of a Z80 second processor. To date, I haven't seen anything written on this matter and would be interested in your comments/advice on the following points:

1. How should the Z80 system be set up in the Master, where should the DFS/NFS ROM be installed?

2. Are there any advantages in using the Z80 second processor instead of the Turbo board (65C102 co-processor)?

3. Can the second processor and co-processor be used together?

Looking forward to your response in the magazine.

Joseph McLaughlin
Ayr

A Z80 second processor can be used with the Master 128 simply plug it into the Tube and switch on.

The Z80 and Turbo board are two totally different items of hardware. Why do you want a second processor? If it is purely for extra memory and speed to run your programs/languages on then the choice is the Turbo board. The Z80 is now somewhat outdated – there are only two reasons someone should consider purchasing it; first you wish to learn how to program in Z80 machine code – an expensive way to learn (a Spectrum is much cheaper!). Second, you wish to run the software which comes bundled with it ie, Memoplan, Cobol or other widely-used CP/M software (*DBase II*, *Wordstar* etc.)

A second and co-processor can be used together.

UNDERSTATED SLICK!

Sir, Having just read Simon Williams review of our *Slick!* utility disc in your January issue, I should like to point out two inaccuracies in an otherwise excellent article.

Simon states that *Slick!* includes a complete sequential filing system. The whole point of the system is that it is an *indexed* sequential system, allowing both direct and sequential access to records by key, a feature not otherwise, so far as we are aware, available on the BBC micro without addition of a ROM to all the machines using the files.

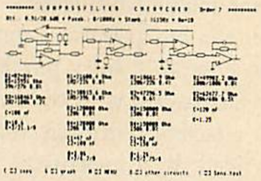
Second, Simon seems to have missed the point of *DCOPY (and *STXFR) in that it not only allows you to preselect the files for copying, but actually buffers them so that they can (with editing of the filenames if required) be transferred to any side of any disc, thus solving a lot of the problems inherent in single disc operation. I know from my own experience how frustrating the limitations can be, and wrote the program in the first place in order to preserve my own sanity!

Barry E James
BJ Computing
Sheffield

PAEAN SYSTEMS

For the BBC B, B+ & Master 128 Microcomputers

ELDESIGN IIe



Anyone seriously engaged in electronics design needs specific filters sooner or later. ELDESIGN II designs analog active filters in the range Order 0 to 8.

*No calculus *No tables
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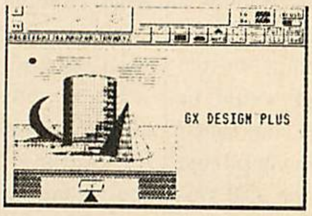
The software comprises Lowpass, Highpass, Bandpass and Bandreject filters. For each filter the five 'classical' approximations are displayed viz. Bessel-curve, Butterworth-curve, Chebychev-curve, Inverse Chebychev-curve and Cauer-curve.

For the filter stages the user may, in most cases, choose from Multiple Feedback, Sallen-Key and Anthoniou circuits. The software provides complete graphical representations of Linear and Logarithmic Gain and Phase graphs, Separate Stage graphs and freely selectable coordinates. Leaflet available on request. Demo disc £5.00 credited against purchase. Screendump routine written for the Star Gemini-10X matrix printer. The software contains a program to adapt the routine for use with other printers. Back-up disc supplied. Suitable for a single sided disc drive.

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*Display is black on white or the inverse allowing easy hidden line removal for solid or see-through colours.
*7 selectable screen colours.
*Built in Epson screen dump allows any parts of or any number of screens to be successively printed out without breaks. Other dump routine may be used.

Suitable for a single sided disc drive.

Price only £24.95 fully inclusive.

MICRO PERT

```
                 BAR CHART :O.D.CAR
 Timescale: minutes
   4    8   12   16   20   24   28
   ¶    ¶    ¶    ¶    ¶    ¶    ¶
************ Change oil
==========---- Change points
====================------ Adjust brakes
               ****** Adjust timing
      Adjust carb **
           Road test ********
```

This program uses the PERT principle to organise projects (such as personal, corporate, educational, training projects etc.) in which numerous separate tasks are to be performed with minimum labour requirements at the lowest cost in the shortest time. It gives rapid estimates of costs and timescales, assessment of cashflow requirements, efficient allocation of labour resources and a 'What if' facility to gauge the effect of varying circumstances. The software can handle up to 64 tasks and 26 labour resources over 104 time units making it powerful enough to cover most applications. It contains two demonstration examples: a simple motor car service and a short printed circuit board development project. Each task is given a description, duration and cost. Where one task is dependent on others finishing, this is specified and taken into account by the software. The theory of Critical Path Analysis is applied to create a Bar Chart giving the overall duration of the project, highlighting tasks which are critical to the completion date and showing those where a degree of time float is available. Daisywheel and matrix printer outputs in serial or parallel are provided. Suitable for a single sided disc drive.

Price £24.95 full inclusive.



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A complete light and executive aircraft flight planning system for accurate navigation and Weight & Balance calculations. The printed output for each leg consists of: Ident/Freq., Safe & Cruise Altitudes, Wind Speed/Bearing, TAS, G/Speed, True Track, Mag. Var., Mag. Trac, Drift, Mag. Heading, Distance, Time, ETA. Total flight distance, time and fuel requirements are provided together with return trip and a note pad for in-flight use. The software accepts the following maxima: 20 Waypoints per flight, windspeed to 150 knots, altitude to 60,000 feet, speed to 700 knots, fuel to 200 gallons or lbs equivalent per hour.

A Weight & Balance envelope can be configured for any individual aircraft, and can be applied to any flight to produce take off & landing weights.

A data disc is supplied containing about 300 Waypoints and Beacons in the UK and these can easily be modified or added to without limit. Please specify 40 or 80 track discs and whether single or twin drives.

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PLUS 3 COMPATABILITY

Sir, I thought I'd let you know that I've transfered George Hill's program (June '85) for the printer driver for use with the *View* wordprocessor onto my Plus 3 disc system and it works very well with my Electron and Brother M1009 printer.

I used the codes given in figure 1 (output from PROCshow driver) without alteration and they produce the effect stated. Thus the Brother printer must be similar to the Epson FX80. I am most grateful for your help.

Dr F W Wilburn
Southport

SEEING STARS

Sir, With reference to Heather Smith's enquiry about Astrological Software (Letters, December 1986) and F Deravi's reply (Letters, February 1987) I would like to add that as well as Astrocalc, who produce an expensive but comprehensive range of astrological programs for the BBC micro, I know of two other sources, which, though not in the same league, are worth considering.

The first is by a company called Signsolve:

5 Brambleside,
Stafford,
ST17 4QW.
Tel: (0785) 662875.

They need birth data and the planetary information from an Ephemeris to be entered. The program then performs all the tedious calculations and presents the information in tabular and chart form, with the option of a printout. Price approximately £7. The other is by:

M Magee,
18 Grafton Road,
Harrow,
HA1 4QT.

Supplied either on cassette or disc, this requires only birth data input. The information is presented in tabular form only, with the option of a printout. Price £11.50 for 40-track disc and £9.50 for cassette.

For anyone interested in writing their own programs then I can heartily recommend *The Manual Of Computer Programming For Astrologers* by Michael Erlewine, obtainable from:

Matrix Software,
315 Marion Avenue,
Big Rapids, Michigan,
49307, USA.
Tel: 0101 616 7962483.

I would be happy to hear from anyone interested in the subject (6 Mill Lane, Deepcar, Sheffield S30 5RN).

Incidentally, I am a regular reader of *AU* and I must say how much I enjoy reading it.

Steve Bass
Sheffield

FRENCH ACCENTS

Sir, Living in France and having a BBC B with the *View* wordprocessor, I was confronted with the problem of using *View* to write letters/articles in French using French characters. My first solution was to set my printer (Epson LX80) to French characters and then define them on the keyboard using VDU 23 and *FX 20,6 and using the respective keys for the various accents. The printer however has, in its character set, all the accents over the letters except circumflexes. It has a circumflex character without a letter underneath it.

At first I tried to solve this problem by a routine which intercepted the print vector and, if the character being printed was an a^, to send a backspace to the printer before the next character. This worked until I wanted to use a printer driver which of course also intercepts the print vector so my routine was useless. The solution I have now only works with printer driver generators which allows you to define the precise codes for each highlight eg, George Hill's *View* printer driver generator (*AU* June '85).

Define one of the codes (I use 140) as a circumflex accent followed by VDU 8 (CTRL-H) which does a backspace. When writing I use the stored command HT 2 140 and when I want to type a circumflex accent I type Shift-f5 – Highlight-2 followed by the letter to be accented. For example (Highlight-2)e would print ê.

I hope this is of help to other readers.

Michael Brown
Paris

ORIC HACKING

Sir, Your reply to R Wall (*AU* January 1987) contained a fundamental error concerning the Oric Atmos.

The Oric, like the Acorn range of microcomputers, is based on the 6502 microprocessor and not the Z80 as stated. This inherent similarity beween the two machines mentioned opens up an interesting and potentially rewarding pastime, 'Oric Hacking'.

By carefully removing the operating system ROM from the socket on the Oric's circuit board, and installing it as a sideways ROM in a BBC micro, Master or Electron, you can read the ROM's contents.

I have found the superb ACP Advanced ROM Manager is ideal for this task, although Beebug's *Exmon* program will also work satisfactorily.

If the contents of the Oric ROM are compared with the Acorn operating system and Basic interpreter, you can learn how to (and not to) write assembly language routines for operations such as addition, multiplication, keyboard scanning etc. If you become hooked on hacking, you could edit the Oric code and produce your own amended version of the Oric ROM.

Three useful books are the *Beyond Basic* and *Advanced User Guide* for the BBC micro and the *Oric Advanced User Guide* by Leycester Whenwell (Adder Press).

Armed with these books, many weeks of educational enjoyment are ahead of you.

This is more constructive than condemning the Oric to a young child's games machine, an insult to both child and machine!

Happy hacking!

Peter M Keen
Derby

ROMS TO EPROMS

Sir, Over the years I have purchased some ROMs and will shortly be making EPROMs with my new EPROM programmer.

As I have no ROM sockets in the BBC micro left, I shall need to purchase a sideways ROM board soon.

I have noticed that with someboards, you can only insert EPROMs into one socket and I would like to be able to use about eight or nine at a time. Could you please advise me on which board I should purchase?

Congratulations on your superb magazine, I enjoy it and find it very interesting.

Graeme McLellan
Edinburgh

There is no functional difference between a ROM chip and EPROM therefore any ROM expansion board will meet your needs.

I recommend that you consult Chris Drage's ROM board roundup published in the May 1986 issue of *AU*.

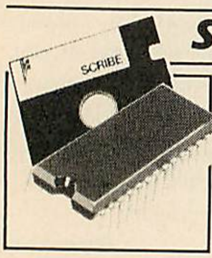
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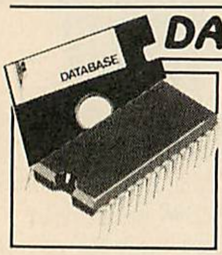
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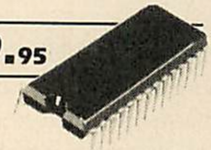
THE PROFESSIONAL WORD PROCESSOR designed for the serious user ⋆ All operations fully prompted ⋆ No special knowledge of the computer system necessary ⋆ Document size NOT limited by computer memory ⋆ Automatic disc buffering ensures text is moved between disc and computer memory without user intervention ⋆ Up to 255 pages in a single document ⋆ 80 column display ⋆ On screen underline and right justify ⋆ See it as it will be printed. Integrates with Database.

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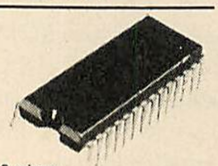
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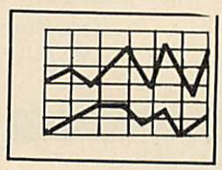
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HINTS & TIPS

Martin Phillips discusses indirection operators and shows how they can be used safely

INDIRECTION OPERATORS

The indirection operators were unique to the BBC micro when it was first produced. They are an elegant method of looking at ('peeking') and directly writing to ('poking') the computer's memory, but have had little light shed on them. The reason is that they can result in poor programs that do not work in all circumstances.

As a simple rule, do not use them to look at where the computer stores its own working numbers, as these locations can differ between machines (and can usually be accessed using one of the operating system calls provided by Acorn). Some readers might say: 'What does it matter, I only use it on my machine,' but there may come a time when you want to use a program on a friend's BBC micro, Master or Electron and you find it will not work. The same may be true if you upgrade, with say, shadow RAM. Also many programs sent to *Acorn User* have to be rejected because they might only work on a few machines, or make 'illegal' use of the BBC micro's memory.

Enough of the warnings. Let us have a play with indirection operators to discover how they can be used safely. There are three indirection operators:

? query	byte indirection operator
! pling	word indirection operator
$ dollar	string indirection operator

A byte is one 'working' memory location. A 'working' memory location is a pigeon hole that can store any number in the range zero to 255. This is not the same as a single memory location buried in a memory chip. Indeed it takes eight individual chip memory locations to obtain one 'working' memory location or byte. The '?' operator will read from, and write to one byte. The '!' operator will read and write to four successive bytes. The '$' operator will write up to 256 successive locations.

To understand better how these operators work it is useful to be able to look at how the memory locations change. Listing 1 (see yellow pages) will do this. It will display a 'page' of memory (figure 1). A page is 256 bytes of memory. Four pages

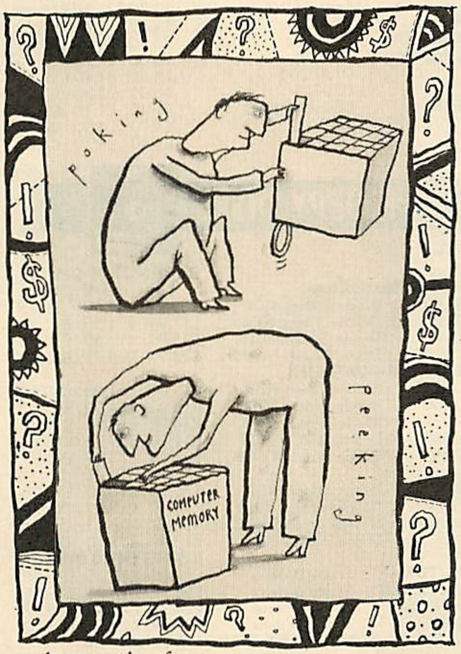


ILLUSTRATION BY AXEL SCHEFFLER

make up 1k of memory.

When entering the start point of memory this should be given in hexadecimal (hex for short). It is easier to work in hex in this application. There are three columns of characters displayed by this program. The column on the left gives the actual memory location of the left-hand cell on that line. The middle column gives the number stored in that memory cell. The number is printed in hex. The right-hand column translates that hex number into the appropriate ASCII character where possible. The control codes (codes in the range zero to 31) or codes greater than 126 are not translated, and are replaced by a full stop instead.

```
Start at page &1900
&1900   D  0  A 1E F4 20 48 69 ..... Hi
&1908  6E 74 73 20 26 20 54 69 nts & Ti
&1910  70 73 20 2D 20 4C 69 73 ps - Lis
&1918  74 69 6E 67 20 31  D  0 ting 1..
&1920  14 18 F4 20 42 79 20 4D ... By M
&1928  61 72 74 69 6E 20 50 68 artin Ph
&1930  69 6C 6C 69 70 73  D  0 illips..
&1938  1E 18 F4 20 46 6F 72 20 ... For
&1940  42 42 43 20 42 2F 42 2B BBC B/B+
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&1950  28 1F F4 20 28 63 29 20 (.. (c)
&1958  41 63 6F 72 6E 20 55 73 Acorn Us
&1960  65 72 20 41 70 72 69 6C er April
&1968  20 31 39 38 37  D  0 32  1987..2
&1970   5 3A  D  0 3C  8 40 25 .:..<.@%
&1978  3D 33  D  0 46  8 EF 20 =3..F..
&1980  31 34  D  0 50  A 61 24 14..P.a$
&1988  3D 22 20 22  D  0 5A  A =" "..Z.
&1990  62 24 3D 22 20 22  D  0 b$=" "..
&1998  64 1E EB 20 22 53 74 61 d.. "Sta
&19A0  72 74 20 61 74 20 70 61 rt at pa
&19A8  67 65 20 26 22 20 73 74 ge &" st
&19B0  61 72 74 24  D  0 6E 18 art$..n.
&19B8  70 61 67 65 3D A0 28 22 page=.("
&19C0  26 22 20 2B 20 73 74 61 &" + sta
&19C8  72 74 24 29  D  0 78 22 rt$)..x"
&19D0  E3 20 6C 6F 63 61 74 69 . locati
&19D8  6F 6E 3D 70 61 67 65 20 on=page
&19E0  B8 20 70 61 67 65 2B 26 . page+&
&19E8  46 46 20 88 20 38  D  0 FF . 8..
&19F0  82 19 F1 20 22 26 22 3B ... "&";
&19F8  20 7E 6C 6F 63 61 74 69  ~locati
```

Figure 1. Output from listing 1

Listing 1 can be condensed down to fit into a function key (see figure 2 on page 43). Key 0 has been defined. Here the listing has had to be broken down into several lines. When typing it in you should not move onto a new line. By entering it as line 10 it is possible to edit it easily if it does not work the first time, and also it can then be saved as a tape or disc program, though do remember to run it first! Enter the starting point in hex, and away it will go. It will print out as well. Before pressing Return but after entering the start point, press CTRL-B, and when it has finished printing, press CTRL-C to stop.

This listing will be required if you want to try out the next few ideas, but it is not necessary to print out the whole page, so change the &FF to read &F, and it will print just two lines, that is 16 locations.

Switch the computer off and on again to reset the memory. Then load in the memory dump program and examine location 2000. You should get a display like this:

```
&2000 0 0 0 0 0 0 0 0 ........
&2008 0 0 0 0 0 0 0 0 ........
```

Locations &2000 to &2015 will all contain zeros. Now type:

```
?&2000=8
```

and display the result again. Location &2000 should now read eight:

```
&2000 8 0 0 0 0 0 0 0 ........
&2008 0 0 0 0 0 0 0 0 ........
```

We could replace the &2000 by the following variable:

```
M%=&2000
?M%=12
```

This will put 12 (hex C) into location &2000:

```
&2000 C 0 0 0 0 0 0 0 ........
&2008 0 0 0 0 0 0 0 0 ........
```

Then the M% can give the starting point for the memory locations:

```
M%?1=5
&2000 C 5 0 0 0 0 0 0 ........
&2008 0 0 0 0 0 0 0 0 ........
```

To read a memory location one asks the computer:

```
PRINT &M%
```

or alternatively:

PRINT M%?1

The pling operator works in the same way.

!M%=&12345678

will produce:

&2000 78 56 34 12 0 0 0 0 xV4. . . . .

&2008 0 0 0 0 0 0 0 0 . . . .

The values put into memory, just happen to be 'x', 'V' and '4' in ASCII. Notice now

```
   10 *KEY0@%=3:VDU14:IN
."&"s$:p=EV.("&"+s$):F.1
=p TO p+&FF S.8:P."&"~1;
" ";:B$=" ":F.L=0 TO 7:c
=1?L:P.~c;:IF c<32ORc>12
6TH.c=46:B$=B$+CHR$c:N.:
P.B$:N. EL.B$=B$+CHR$c:N
.:P.B$:N.|M
```

Figure 2. Listing 1 condensed

that the four bytes are placed backwards in memory. This appears complicated but seldom causes problems. This operator is useful for storing and reading integer variables (the variables followed by a % sign) which occupy four bytes. Real variables are stored in five bytes, so cannot be stored in this way. They can be converted to a string however and then stored.

The dollar operator works similarly, but puts a string into the nominated place in memory. To distinguish it from an ordinary string, the $ sign is placed first:

$M%="Acorn User"

&200041636F726E205573AcornUs

&2008 65 72 D 0 0 0 0 0 er. . . . . .

Notice one difference with the dollar indirection operator. As this operator can take a string of any length from zero to 255 characters, it has to put a marker at the end of the string. This marker is the ASCII code for Return, &D. A neat way of manipulating strings can be achieved using the dollar indirection operator. Thus:

M%=M%+6:PRINT $M%

will print 'User'. The dollar indirection operator can be used in much the same way as the LEFT$, MID$, and RIGHT$ Basic statements, but can be much more flexible in use. For example:

```
10 M%=&2000
20 $M%="Acorn User"
30 FOR N%=M%+10 TO M% STEP-1
40 PRINT CHR$ (?N%);
50 NEXT N%
```

This small program above moves the pointer N% to the last character in the string, where the number is retrieved and printed out as an ASCII character. Thus by stepping backwards through the string, it can in fact be printed out in reverse.

A final point is a consideration of which area of memory is used. With these indirection operators, we need to ensure that the memory area chosen does not affect anything else, or is likely to be overwritten. So far, all the examples have used areas of memory that I know to be safe for these examples. We could have let the computer choose a safe memory area:

DIM M% 1000

which will reserve 1001 bytes (remember that the computer starts counting at zero), and consequently the starting position will be held in the variable M%.

Basically that is all there is to indirection operators. What can they be used for? One thing that they are very useful for is manipulating text. Text can be loaded into a spare part of memory and then manipulated in many ways. Listing 2 (on the yellow pages) shows one example of this. This program is designed to alter text files from one wordprocessor so they can be read by other wordprocessors. This program will enable files to be transferred easily between *View* and *Wordwise* amongst others. It should be noted that files for *View* will need to be loaded in using the READ command rather than the normal LOAD command.

The problem in transferring text files is not usually that the formats are incompatible, but there are a lot of unwanted characters or spaces used to pad out the lines and returns which force new lines. These are often very tedious to edit out and transferring a *View* file to *Wordwise* can take quite some time. Therefore what this program does is to look through the text file, and change any control code characters to spaces. In particular it gets rid of all the return characters which force a new line (though *View* will put a few back in). Then the program goes through the file again and removes all the surplus spaces that it finds, so that there is not more than one space together.

It does this by looking for multiple spaces and then shuffling the rest of the text file down in memory to overwrite the surplus spaces. Then the file can be resaved, and loaded into another wordprocessor. As the text will now be completely unformatted it will be necessary to go through it and reformat it, but this is usually straightforward.

To use the program, first find the length of the file in hex. This can be found from a disc file by using the *INFO command. The file length is the third number that will be printed out. Then load the file into some area of memory, &3000 is a suitable place, eg, to load a file called 'JUNK' use the command:

*LOAD 'JUNK' 3000

Then load and run the file conversion routine. It will ask for the start position of the text, in this example it will be &3000. Then it will ask for the file length. When this has been input, the program will unformat the text file, and when it has finished it will give the new file length. Then the file can be resaved. For example if the new file length is &5AB, use the following command:

*SAVE JUNK 3000 +5AB

For those that want to unformat *Wordwise* files, a procedure can be added to remove all the embedded commands. This looks through the text for the start code (ASCII code 2) and changes everything after it to spaces until it meets the end code (ASCII code 7). This latter code will be changed by line 120. The program will then strip out the surplus spaces. Add the lines in figure 3 (below) to listing 2.

```
  115 PROCwordwise
  330 :
  340 DEF PROCwordwise
  350 PRINT "Removing em
bedded commands"
  360 FOR N%=S% TO E%
  370 IF ?N%<>2 THEN GOT
O 410
  380 REPEAT
  390 ?N%=32:N%=N%+1
  400 UNTIL ?N%=7
  410 NEXT N%
  420 ENDPROC
```

Figure 3. Additional lines to listing 2

Similar procedures could be implemented to remove codes from other wordprocessors. To find these codes, use listing 1 after loading a sample text file into memory. It is then quite easy to identify particular formatting codes.

A second example is a program that has long fascinated me, ever since I saw a version in the Acorn Atom handbook. This is a tree-type database program (listing 3 on the yellow pages) that learns as it goes along. By using the indirection operators, this type of database is actually quite easy to program.

The program could have been achieved

in a number of ways; arrays for instance. A tree-structured database has a structure like figure 4. These programs can be made to learn as they go along. If the program reaches the end of the tree, and the correct animal is not found, it will ask what the animal was. A new question then has to be entered, and this is added into the structure, so that the tree grows.

Listing 3 shows a tree program for animals. It could easily be adapted for a variety of tasks. A sample text print out would be:

Are you thinking of an animal?

Yes

Does it have four legs?

No

Is it a sparrow?

No

What were you thinking of?

A duck

Tell me a question that will distinguish between a sparrow and a duck?

Can it swim?

What would the answer be for a sparrow?

No

The last question is necessary because the program needs to know whether the question that has been input refers to the duck or the sparrow. Then the program will start again. If you are not thinking of an animal, then the program will save the tree structure, which can then be loaded in the next time.

The program has a very simple storage structure. Basically each entry has three elements. The text, a 'yes pointer' and a 'no pointer' as shown in figure 5 below. The program is easily able to differentiate between an animal and a question because the animals do not have a yes or a no pointer to jump to. When a question has been asked, the program will jump to the location given by the 'yes pointer' or by the 'no pointer'.

Programming this is really quite simple.

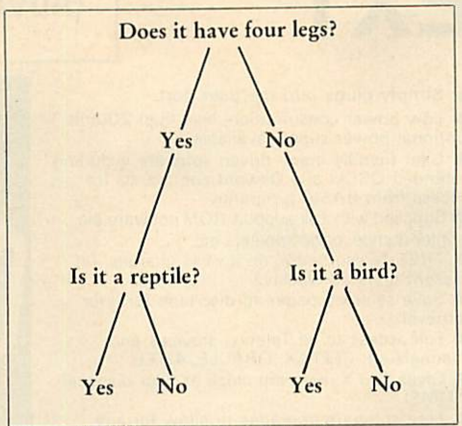


Figure 4. A tree structured database

The first 40 locations are reserved for the text string. The next four are for the 'yes pointer' and the next four are for the 'no pointer'. E% gives the current end of memory position. a% gives the offset to the 'yes pointer', b% gives the offset to the 'no pointer', and c% gives the offset to the new end of the file. Thus to add a new animal the following structure is used:

$E%="A DOG"	Put text into memory.
E%!a%=0	Put 0 into 'yes pointer'
E%!b%=0	Put 0 into 'no pointer'
E%=E%+c%	Move end of file pointer

Finally listing 4 is the essential add-on to the tree program, a method of editing the text in the tree structure. This is a most useful extension.

Description of listing 1

Line 60 Set print format to three (each number will be allowed three spaces when printing out) and put page mode on.

Line 100 Get the start point for the memory dump. This must be entered in hex. The input is entered into a string, as the INPUT statement will not accept a hex input.

Line 110 Convert the string back to denary using the EVAL statement.

Line 120–220 Loop to cycle through one page of memory eight locations at a time. This could be altered to look at more than one page, or less than one page by altering the &FF.

Line 130 Print memory location at start of each line. The will stop the print statement going to a new line after printing.

Line 140 Set B$, the string that will contain the ASCII characters, to contain the space code only.

Line 150-200 Loop to print out the contents of eight locations.

Line 160 Look at the memory location (location+line) and store in the variable called 'contents'.

Line 170 Print out value in hexadecimal.

Line 180 If the ASCII value is less than 32 or more than 126, replace its value with the ASCII value for a dot instead. If a number less than 32 or greater than 126 is converted to its ASCII code, all sorts of odd effects can and do happen. Try leaving this line out to see the effect!

Line 190 Add the ASCII character onto the end of B$.

Line 210 Print out the ASCII codes for that line.

Description of listing 2

Lines 70–110 Input the file start position and the file length. These must be entered in hex, which is more convenient as the load and save addresses are given in hex. The input is entered into a string, as the INPUT statement will not accept a hex input. The strings are converted back to denary using the EVAL statement.

Lines 110–130 Go through the text changing characters less than 32 or more than 126 to spaces. These can be removed.

Lines 140–180 Go through the text again, this time looking for spaces. If two spaces are found together then go to PROCshuffle to remove the surplus spaces. A message is printed on the screen, mostly for reassurance that the program is actually doing anything!

Line 190 Print out that the program has finished.

Line 200 Print out the new file length to be saved. This should be less than the original file length. By saving the exact file length it avoids having extra garbage included at the end of the text. Note that this program could easily be extended to automatically load and save the file. See listing 3 for details of how to do this. Also it is possible to automatically find the old file length by

Location	Text	Yes PTR	No PTR
3000	Does it have four legs	3030	3060
3030	A dog	0	0
3060	Can it swim	3090	30C0
3090	A sparrow	0	0
30C0	A duck	0	0
30F0			

Figure 5. Program storage structure

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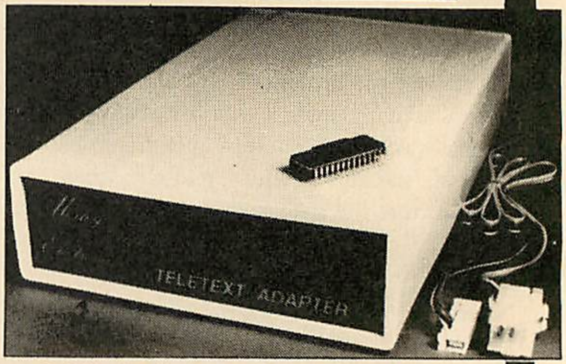
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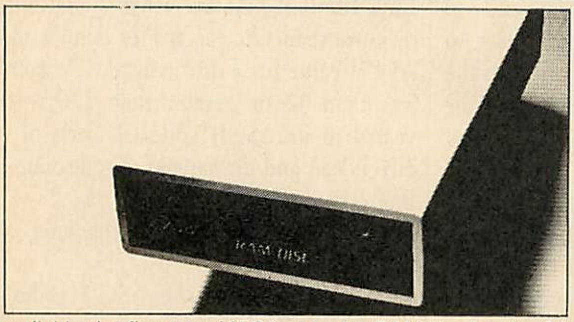
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Lines 230-320 The procedure to remove any extra spaces.

Line 250-270 These lines were included to speed up the program. Basically it will check to see if there is a long string of spaces together, all of which can be deleted in one go.

Lines 280–300 Step from the current point in memory to the end, relocating the text down the number of places determined by line 250.

Line 290 This line is the heart of the procedure. It says take the s%th character further on from N% and put it in the location at N%. If this is repeated for the rest of the text, then the text will be shuffled down in memory and will therefore overwrite the surplus spaces.

Line 310 Reduce the end point by the number of spaces removed.

Description of listing 3

Line 70 The initialisation procedure.

Line 80 The procedure to load a file.

Line 90 The main procedure.

Line 100 The procedure to save the tree.

Lines 140-150 S% is the start of memory location. E% gives the end point in the memory. Initially this is set to four locations further on from the start point. This then allows space for this pointer value to be added at the start of the file when saving to tape or disc. a% allows space for a text file of 39 characters plus a return code. b% allows space for the text file and the first pointer. c% is the total length for a single entry.

Lines 160–210 Data to start the tree. The text in these lines can be changed to suit ones application.

Line 250 P% is the pointer to the memory location of the current record.

Line 260 Clear any text windows and clear the screen.

Lines 270–280 Print the title in double height. Electron owners should not enter line 280, and should omit the CHR$141.

Line 290 Set a text window on the screen so that the title is not scrolled.

Line 300 The question to start the tree off. Again the text here can be changed to suit one's application.

Line 310 A procedure which will only accept a 'Y' or a 'N' as an input.

Line 320 Answering 'N' here will end the program after saving the current tree file.

Line 330 The 'yes pointer' will be zero if the text contains an object rather than a question. Therefore if an object is recognised, the words 'is it' are printed out.

Line 340 Print the object or the question.

Lines 360–370 If an object than either the computer wins or a new object can be added to the tree.

Lines 380–390 If a question then jump to the next branch in the tree.

Lines 430–460 Wait until the 'Y' key or the 'N' key is pressed, then print either 'Yes' or 'No'.

Lines 500–570 Input a new object and a new question. Checks are made to ensure that the length of the text is within the allowed length. Line 560 is necessary to ensure that the question is related to the correct object.

Lines 580–630 Put the new question and object into the tree and set the 'yes pointer' and the 'no pointer'.

Lines 670–720 Ask if there is a tree to load. If yes, load the file 'TREE' into the memory area reserved for the tree. Save the memory area of the tree. It is always saved under the filename 'TREE'.

Description of listing 4

Lines 80–100 The load and save procedures are the same as listing 3 (except that there is no option but to load the file), and instead of the run procedure there is an edit procedure.

Line 140–150 Print the title in double height. Electron owners should not include line 160 and should omit the CHR$141 in line 150.

Lines 190–240 Step through all the text, allowing a new input to be made as required. Simply pressing RETURN leaves the original text unchanged.

See yellow yages 127-128 for full Hints & Tips listings.

PRESERVING ARRAYS

When DIM is used in a Basic program, it reserves a section of memory for the array. The size of the reserved section depends upon what type of array (whether byte, integer, real or string array).

When the program is run the memory space is used for the arrays and for any other variables that are created. If the program is stopped by any sort of error, then the variables are still accessible. Try this:

```
10 DIM A$(2)
20 A$(1) = "Fred"
30 STOP
```

Run the program: it stops at line 30. Type in:

```
PRINT A$(1)
```

It's still there! All the variables are still accessible, and the program can be listed in the normal way.

A problem arises if a program line is edited. Basic loses track of all the variables, and they cannot easily be found again. This is because extending a program line makes use of the memory above the program. The edited program may be longer than the original. It is this very memory that contained the arrays and variables, so they may be overwritten and lost.

In some types of program, it is imperative that the variables, particularly arrays, be retained if the program crashes.

One way to do this is to write an ON ERROR routine that saves the arrays before ending the program:

```
10 ON ERROR PROCerror
20 DIM A$(2)
30 A$(1) = "Fred"
40 REM rest of program
:
:
100 DEF PROCerror
110 F% = OPENOUT "Safe"
120 FOR A% = 0 TO 2
130 PRINT# F%, A$(A%)
140 NEXT
150 CLOSE# F%
160 REPORT
170 PRINT "at line"; ERL
180 STOP
190 ENDPROC
```

This should save the array A$( ) in a file called "Safe". It can be loaded into a new program using a procedure like this:

```
1000 DEF PROCreload
1010 F% = OPENIN "Safe"
1020 FOR A% = 0 TO 2
1030 INPUT# F%, A$(A%)
1040 NEXT
1050 CLOSE# F%
1060 ENDPROC
```

The new program should DIM the A$ ( ) array, then call PROCreload to read the saved array from the file.

```
10 DIM A$ (2)
20 PRINT "Reload old array";
30 IF GET$="Y" then PROCreload
40 PRINT
50 REM rest of program
```

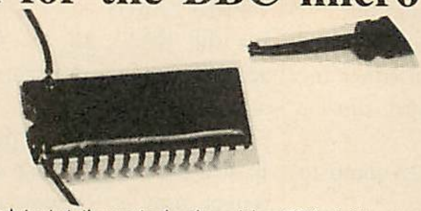
This idea can be extended to other sorts of arrays too, so byte arrays or arrays of real numbers could also be preserved.

This may be of use when writing database programs, the data is in fact safe even is the program crashes.

Turn to the yellow page index on page 113 for, details of Martin Phillips' Hints & Tips listings.

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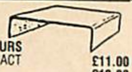
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FIRST BYTE

RAMMING IT HOME

We try to sort out the confusion between ROM and sideways RAM

Tessie Revivis

A letter came flooding into the *Acorn User* office from Keith Low of Pickering. Keith like many other readers is a little confused as to how ROM and RAM are arranged on the Master 128 and the Master Compact, so to try and remedy this, we'll take a breather from machine code this month in order to examine the memory arrangements of these two micros.

The Master 128 and Compact are supplied with 128k of memory. This does not appear as a single block of memory but is broken down into several sections. The 'first' 32k of this memory is random access memory, RAM for short. This is used to hold and run programs. Indeed the listings you enter from *Acorn User* are stored in this 32k.

RAM is volatile, which means that it will only hold programs while the power is switched on. Turn the computer off and the RAM contents fade away. This is why we must save our programs to tape or disc.

The next block of 32k is read only memory (ROM). This is non-volatile or permanent memory which is electronically programmed into special ROM chips. As such the contents remain unchanged even when power is switched off. This block of 32k is further divided into two blocks of 16k, the first of which is normally the Basic ROM while the second and the upper half forms part of the machine operating system (MOS) also sometimes known as the OS (operating system). Its sole task is to control the household operations, for example the screen display, getting characters from the keyboard, etc.

The first 64k is the total amount of memory that the 6502 series microprocessor can control: not much in these days of megabytes. To get round this limited memory Acorn designed into the original BBC micro sideways ROM and RAM. Figure 1 illustrates how the term 'sideways' originated with the ROM and RAM arrangements. The ROM and RAM slots, of which there are 16 in all, sit along side the Basic ROM.

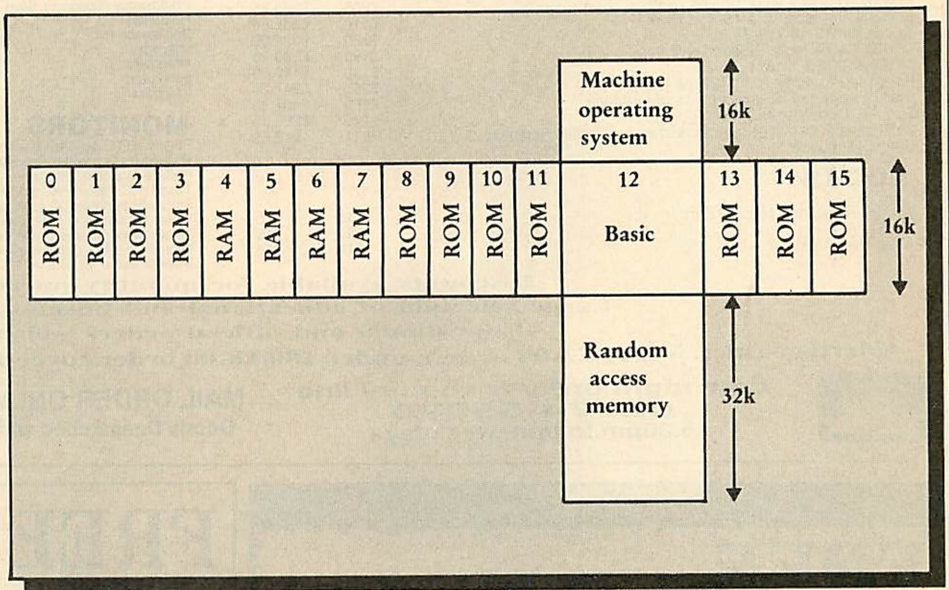


Figure 1. The arrangement of sideways ROM and RAM areas in a Master 128

As you can see from figure 1 only the Basic ROM sits in the main memory area, the 'memory map'. To gain access to the other ROMs it is necessary to lay them over the Basic ROM. This is normally termed 'paging a ROM in' and explains why the term paged ROM is sometimes used instead of sideways ROM.

The sideways ROM and RAM each measure 16k in length and each section of sideways ROM and RAM is called a 'bank'. There are four banks of sideways RAM in figure 1. These sideways RAM banks may be used in three ways. The first is for sideways ROM images. A ROM image is a ROM program that is saved on disc which can then be loaded into a sideways RAM bank to act as a ROM. Compact owners will know that they have *View* and Logotron Logo ROM images on the Welcome disc which can be loaded into a sideways RAM bank for use. Listing 1 (on the yellow pages) when run will create a small ROM image on disc which you can then load into sideways RAM and by typing a single star command provide you with the length of your program and the amount of memory free.

Alternatively you can use the four sideways RAM banks as a continuous 64k of memory for use with Basic 128. BAS128 as it is known can be found on the Welcome disc and can be run using:

```
*LIB LIBRARY
*BAS128
```

The final use of the sideways RAM banks is for data storage and the banks may be used individually or in combinations of your own choice. Listing 2 provides a program which shows the RAM banks being used in this way.

To distinguish each ROM or RAM bank from an associate, each bank is given a number from zero to 15. The number of a bank is important as it indicates the ROM or RAM priority. The rule is the higher the number the more important the bank is. Thus if you have ROMs fitted in positions four and seven which both have a

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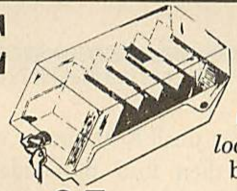
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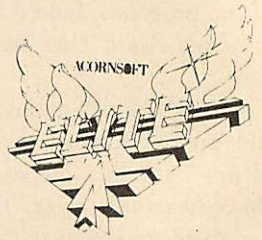
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*DOTHIS command then ROM 7 will get to execute the *DOTHIS command.

The Master 128 is supplied with a MegaROM and this contains in it various ROMs which are mapped into some of the 16 ROM bank positions as follows:

ROM 15 Terminal
ROM 14 *View*
ROM 13 Advanced disc filing system
ROM 12 Basic
ROM 11 EDIT
ROM 10 *ViewSheet*
ROM 9 Acorn disc filing system
ROM 8 Empty
ROM 7 Sideways RAM
ROM 6 Sideways RAM
ROM 5 Sideways RAM
ROM 4 Sideways RAM
ROM 3 Empty
ROM 2 Empty
ROM 1 Empty
ROM 0 Empty

The MegaROM spreads across seven ROM banks from nine to 15 inclusive. The Terminal ROM is in fact quite small and takes up very little space. The majority of the ROM contains the other 'half' of the MOS which is 35k long and also spills over into the *View* ROM. Of course as far as we are concerned it does not appear in either of these sockets.

The sideways RAM banks are mapped into bank numbers four, five, six and seven leaving banks zero, one, two, three and eight free for ROMs. I would refer readers to the October 1986 Hints and Tips which contain an excellent overview of the ROM socket arrangements. The Master 128 also contains two cartridge slots which occupy ROM positions zero, one, two and three. These can be used as four 16k ROMs – two on each cartridge. Internally there are three ROM sockets. The top most of these is used by ROM number eight, and this generally should be used to hold any other single ROM that you may wish to fit.

The other two ROM sockets are for 32k ROMs and these occupy positions four, five, six, and seven. But this is sideways RAM, I hear you say, and of course you are quite right. However, the Master 128 is designed in such a way as to allow us to use banks four to seven as either RAM or ROM. Normally they are set to act as RAM, however we can convert one or both of them into ROM by changing the settings of links 18 and 19. The important thing to remember here is that when you are using sideways RAM any ROMs plugged into these two sockets will not be seen unless links 18 and/or 19 are changed. If this is the case then it is not possible to use the sideways RAM as sideways RAM.

On the Master Compact things are more straightforward. The MegaROM is in fact half the size, just 64k. ROMs are present in the top three positions only, thus:

ROM 15 Utils
ROM 14 Basic
ROM 13 Advanced disc filing system

Utils, like Terminal on the Master, contains mainly the second half of the operating system. The Master ROM banks nine, 10, 11 and 12 are not used by the Master Compact. Sockets for banks zero, one, two and three appear inside the machine and banks four to seven are only ever used as sideways RAM.

The final 32k of the 128k is split into two. 20k of this supplies the shadow screen memory. In the original BBC micros, memory was always tight because the RAM needed to display the screen was taken from the RAM needed for programs. So with the BBC B+ and Master series micros a special screen memory was supplied so that all the normal RAM is free for programs. Shadow RAM is selected by adding 128 to the normal screen mode. Mode 131 is the shadow RAM version of mode 3. The final 12k is arranged in a special manner that is not normally accessible by the programmer and is used by the ROMs in the micro as data storage space.

Listing 1 contains numerous lines of data. The data is machine code which will be read by the main program loop into memory and then transferred across into sideways RAM bank six using the *SRWRITE command. When the prompt reappears, press the Control and Break keys together. Typing *ROMS should show that the Memory ROM is present. Typing *MEMORY at any time will provide the following: length of your program and the amount of memory free.

Listing 1 shows the conventional use of sideways RAM, however it can be used as a data storage area. To convert a RAM bank into a storage area we must use the *SRDATA command. To configure all banks as DATA stores we would use:

*SRDATA W
*SRDATA X
*SRDATA Y
*SRDATA Z

The letters W, X, Y and Z can be replaced by four, five, six and seven. However, letters are used for compatibility with BBC B+128 owners. You do not have to use all four banks at a time, you can use any combination of the four, though it is best to use them in banks side by side so that the data storage area is continuous.

Listing 2 uses all four banks to store several screen pictures which are then displayed one after the other. In normal use sideways RAM begins at address &8000 but when in data storage mode (referred to as pseudo addressing) it is addressed from &O to &FFFF. Listing 2 saves some mode 4 screens to the sideways RAM using the *SRWRITE command. The first two addresses after the command are the start and end addresses of the mode 4 screen (5000 and 8000) in hexadecimal. As each screen is &3000 bytes in length each successive *SRWRITE command has the final address incremented by this amount. The final address then is not really an address but a displacement from the start of the sideways data banks.

There are a few commands built into the Master 128 and Compact micros which act directly on sideways RAM, these are detailed below where ‹id› represents the RAM bank number.

***SRDATA ‹id›** Sets sideways RAM bank ‹id› up to receive data. If several banks are used then the data may flow across from one bank to another. However, the banks defined by SRDATA must be adjacent.

***SRLOAD ‹fsp› ‹addr› (‹id›) (Q)** Loads the named file ‹fsp› into the sideways RAM bank ‹id› starting at address ‹addr› which will normally be 8000. If Q is used then program memory will be corrupted.

***SRREAD ‹addr› ‹addr› ‹addr› (‹id›)** Reads the contents of sideways RAM bank ‹id› into main memory. The first parameter is the main memory start address, the second is the end address, and the third is the start address in sideways RAM (again normally 8000).

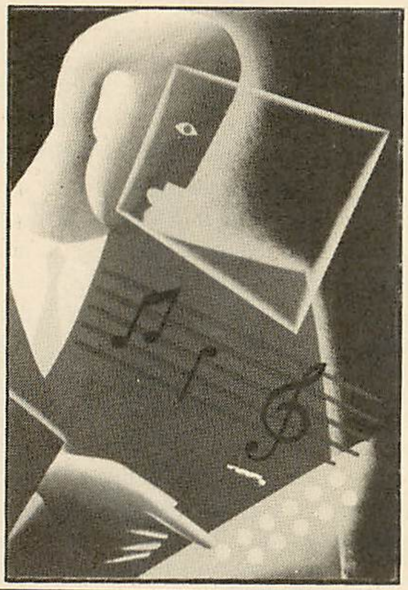
***SRROM ‹id›** Reverts the specified RAM bank back into its normal sideways RAM operating mode.

***SRSAVE ‹fsp› ‹addr› ‹addr› ‹addr› ‹id› (Q)** Saves the sideways RAM bank ‹id› to disc/tape using the filename ‹fsp›. Address parameters are as for *SRREAD.

***SRWRITE ‹addr› ‹addr› ‹addr› (‹id›)** Transfers data to sideways RAM from the main memory. The first parameter is the main memory start address, the second parameter is the end address and the third the start of sideways RAM.

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Mike Barwise considers readers' ideas on sideways RAM, Basic subroutines and Atoms

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SIDEWAYS MEMORY TESTING

My notes in December '86 Forum about BBC micro RAM testing have elicited a very interesting submission from Dr Martin Sohnius, who is physicist at King's College, London. His BBC micro is a model B with Watford sideways board, and in the past he has had a lot of intermittent failures.

The routine was developed to pin these down by defining the faulty socket, and it prints out a nice little list of sideways sockets and their contents.

Apart from the neatness of the actual program, Martin has used some really nice techniques. Disliking the Basic assembler, he has used *View* to create the source code. This allows a very free entry layout and results in much clearer source listings. The inclusion of an Auto at the head of the file allows it to be EXECed to create runnable Basic assembler. The positioning of the comments before the assembler statements is a matter of choice: it produces a very neat listing at the expense of comment length. I personally like massive comment headers followed by code, and would recommend experimentation with different layouts.

How does the program work? To make it work at acceptable speed, it performs two 'illegal' calls. Naughty, naughty, but I feel, totally legitimate. If you find a compatibility feature which wrecks your system's usefulness, as long as you document your fiddle well, go ahead and cheat. After all, at the end of the day we are talking about doing jobs efficiently and well, and any serious user of a slightly different machine can find their own solution.

The illegals are both pokes to hardware latches: the &FE30 ROM paging register and the &FF30 to &FF35 Watford board write latches. The Watford latch pokes are unavoidable, and the &FF30 poke saves an enormous amount of time.

The program starts with the highest number socket (15) and ends at socket zero. For each socket, it first finds out whether the socket is empty, and if not what it contains. This is done by analysis of the header. Next, if the socket contains RAM, this is tested exhaustively by toggling each bit twice. There is no long delay between write and read at a given location as would be necessary for dynamic RAM testing,

Listing 1. Prints list of RAMs

```
   10 REM Sideways RAM t
ester
   20 REM by Martin Sohn
ius
   30 REM for BBC B/B+/M
/C/E
   40 REM (c) Acorn User
 April 1987
   50 :
   60 osbyte=&FFF4
   70 osnewl=&FFE7
   80 oswrch=&FFEE
   90 osrdrom=&FFB9
  100 latch=&FE30
  110 write=&FF30
  120 :
  130 temp=&A8
  140 old_socket=&AA
  150 socket=&AB
  160 empty_flag=&AC
  170 active=&F4
  180 ptr=&F6
  190 :
  200 start=&900
  210 :
  220 FOR pass=0 TO 2 ST
EP 2
  230 P%=start
  240 [
  250 OPT pass
  260 .roms
  270 LDA active
  280 STA old_socket
  290 LDY #15
  300 .main_loop
  310 STY socket
  320 STA write,Y
  330 STY empty_flag
  340 TYA
  350 JSR hex_nibble
  360 JSR type
  370 JSR test
  380 BIT empty_flag
  390 BMI no_title
  400 JSR title
  410 .no_title
  420 JSR osnewl
  430 LDY socket
  440 DEY
  450 BPL main_loop
  460 RTS
  470 :
  480 .type
  490 LDA #&AA
  500 LDX #0
  510 LDY #&FF
  520 JSR osbyte
  530 STX ptr
  540 STY ptr+1
  550 LDY socket
  560 LDA (ptr),Y
  570 ASL A
  580 BEQ empty
  590 BMI language
  600 BCS utility
  610 .empty
  620 SEC
  630 ROR empty_flag
  640 JSR message
  650 OPT FNequs ("  emp
ty     ")
  660 BRK
  670 RTS
  680 .language
  690 JSR message
  700 OPT FNequs ("  lan
guage ")
  710 BRK
  720 RTS
  730 .utility
  740 JSR message
  750 OPT FNequs ("  uti
lity  ")
  760 BRK
  770 RTS
  780 :
  790 .test
  800 LDA #&80
  810 STA ptr+1
  820 LDY #0
  830 STY ptr
  840 LDA socket
  850 STA active
  860 STA latch
  870 .test_loop
  880 LDA (ptr),Y
  890 EOR #&FF
  900 STA (ptr),Y
  910 NOP
  920 NOP
  930 CMP (ptr),Y
  940 BNE error1
  950 EOR #&FF
  960 STA (ptr),Y
  970 CMP (ptr),Y
  980 BNE error2
  990 INY
 1000 BNE test_loop
 1010 INC ptr+1
 1020 BIT ptr+1
 1030 BVC test_loop
 1040 BVS end_test
 1050 .error1
 1060 EOR #&FF
 1070 .error2
 1080 STA (ptr),Y
 1090 CLC
 1100 .end_test
 1110 LDA old_socket
 1120 STA active
 1130 STA latch
```

Continued ▶

◀ **Listing 1 continued**

```
1140 BCC not_good
1150 JSR message
1160 OPT FNequs ("RAM
")
1170 BRK
1180 RTS
1190 .not_good
1200 LDA #&80
1210 CMP ptr+1
1220 BNE bad_ram
1230 CPY #0
1240 BNE bad_ram
1250 JSR message
1260 OPT FNequs ("
")
1270 BRK
1280 RTS
1290 .bad_ram
1300 STY ptr
1310 JSR message
1320 OPT FNequs ("bad R
AM at ")
1330 BRK
1340 LDA ptr+1
1350 JSR hex_byte
1360 LDA ptr
1370 JSR hex_byte
1380 .space
1390 LDA #ASC" "
1400 JMP oswrch
1410 :
1420 .title
1430 LDA #7
1440 STA ptr
1450 LDA #&80
1460 STA ptr+1
1470 LDY socket
1480 JSR osrdrom
1490 STA temp
1500 INC ptr
1510 JSR rom_print
1520 LDY ptr
1530 CPY temp
1540 BEQ end_title
1550 .rom_print
1560 INC ptr
1570 LDY socket
1580 JSR osrdrom
1590 JSR oswrch
1600 TAY
1610 BNE rom_print
1620 .end_title
1630 JMP space
1640 :
1650 .message
1660 PLA
1670 STA temp
1680 PLA
1690 STA temp+1
1700 LDY #0
1710 TYA
1720 .messg_loop
1730 INC temp
1740 BNE no_carry
1750 INC temp+1
1760 .no_carry
1770 JSR oswrch
1780 LDA (temp),Y
1790 BNE messg_loop
1800 LDA temp+1
1810 PHA
1820 LDA temp
1830 PHA
1840 RTS
1850 :
1860 .hex_byte
1870 PHA
1880 LSR A
1890 LSR A
1900 LSR A
1910 LSR A
1920 JSR hex_nibble
1930 PLA
1940 .hex_nibble
1950 AND #&0F
1960 SED
1970 CLC
1980 ADC #&90
1990 ADC #&40
2000 CLD
2010 JMP oswrch
2020 :
2030 ]
2040 NEXT pass
2050 :
2060 IF FNsum(start, P%
-1) = 1 THEN PROCoscli (
"save RAMTEST 900 B00"):
END
2070 VDU 7
2080 PRINT "checksum er
ror"
2090 END
2100 :
2110 DEF FNsum (start%,
end%)
2120 LOCAL sum%,I%
2130 FOR I%=start% TO e
nd%
2140 sum%=sum% + I% * ?
I%
2150 NEXT I%
2160 =sum% MOD 1000
2170 :
2180 DEF PROCoscli (str
ing$)
2190 DIM X% 100
2200 Y%=X% DIV 256
2210 $X%=string$
2220 CALL &FFF7
2230 ENDPROC
2240 :
2250 DEF FNequs (string
$)
2260 $P%=string$
2270 P%=P%+LEN string$
2280 =pass
```

as the sideways RAM is static, so there is no potential refresh failure to test. An interesting question (maybe someone has the answer) is: why do we need the two NOP instructions at 990 and 1000? I have not come up with an answer yet. However, the RAM test is quite unreliable in their absence. After the RAM test, the title of any ROM present is printed, and then the whole process repeats for the next ROM socket.

There are some clever tricks all through the program, which, is really well written: a primary handler calls a succession of independent subroutines. This approaches object oriented rather than structured programming, and is a highly adaptable method.

The conversion works by fooling the processor as to the number base it is working in. The fundamental structure is: isolate a nibble in binary, move to decimal, add 90 (decimal), add 40 (decimal) and move to binary.

Let's follow this through with an example. Say the accumulator contains &2A (hex). The first nibble isolation yields 02. This is the same in binary as in decimal, so on entry to decimal mode it is unchanged, and the previously cleared carry flag stays clear. Now add 90 (decimal), and you get 92. Add 40 (decimal) and you get 132 (decimal) with one in the carry flag and the 32 in the accumulator. On re-entry to binary mode, the bit pattern is retained, yielding &32, which is ASCII 2. Discard the carry and print this, then isolate the second nibble which is &OA. This is more than nine, so on entry to decimal mode, there is a carry across between the low and high digits (decimal). This sets the carry flag. &OA equals 10 (decimal) so add 90 then 40 and you get 140 (decimal) plus the one in the carry flag, or 141. Move to binary mode and you get &41, which is ASCII 'A' ready to be printed. Neat, isn't it?

Martin points out that the RAM test program can only be loaded from the monthly cassette or disc in mode 7, as the source is large due to the comments. Listing 2 is a shortened version of the program.

Another nice one, again by Martin, is a method of verifying the stack RAM without disabling interrupts. I didn't think it could be done this easily!

Martin's routine is:

```
TSX
TXA
LDX#82F
TXS
PHA
JSR test high ram
PLA
TAX
```

TXS
JSR test low ram

where 'test high RAM' is a subroutine that tests RAM as in the main program from &130 to &1FF, and 'test low ram' is a similar subroutine that tests from &100 to &12F.

This routine is really neat. Resetting the stack and pushing the old stack pointer on the stack itself is about as imaginative a dodge as you could think up. The only restrictions are a maximum active stack of 208 bytes, and a limitation of 45 bytes available to the RAM test routines and current interrupts. This covers about six nested interrupts plus a safe margin, or say five plus three nested subroutine calls plus a safe margin, so it should never pose a problem. The interrupts should probably be turned off briefly while the stack pointer is being manipulated.

There are lessons for many of us in this piece of programming: it was obviously thought out first, then keyed in. Most part-time programmers key in from cold, so they never get to work out the details until a vast octopus of code is already throttling them at their desk. Let's see more submissions like this!

Martin Sohnius has asked that this routine be treated as 'public domain'. In other words, it can be freely copied and distributed as long as credit is given, and it is not charged for.

£10 ASSEMBLER AND ATOM EDITOR

Ian Stewart of Liverpool gets ten quid for a neat set of routines which allow Atom assembler and Basic files to be edited on the Bearsoft Editor. The routines are short enough to be preloaded to pages £28 and £29, where they are safe from corruption and can be accessed via the 'Q' command from within the Editor. Ian is actually the first Editor user to submit any routines for use under 'Q',

```
10Z=£3000
20IF Z?1=255 G.60
30DO Z?1=32;Z?2=32
40Z=Z+3+LEN(Z+3)
50U. Z?1=255
60Z?2=4
70EDIT
```

Listing 2. Replaces all line numbers

although the Editor has been around for almost two years!

Disc users could alternatively *RUN them at £2900 directly from disc. The routines themselves are fairly standard, but the use of them in this context is really well thought out.

The first routine (listing 2) replaces all the line numbers in an assembler program at £3000 with spaces, so that the line numbers cannot corrupt the Editor screen. It should be run before entering the Editor, but after the Editor has been loaded from disc or the Editor ROM has been selected on your paging system. All normal features of the Editor may then be used to modify and correct the assembler file. When you are happy with it, you run the second routine (listing 3) by hitting 'Q' and answering the prompt with the base address of the routine (£2800 or £2900). This exits from the Editor, does a conventional renumber in increments of 10, and sets PAGE and TOP to point to the assembler at £3000.

```
10?£202=£D8;?£203=£C9
20!£208=£FE94FE52
30P.$27,$12,$27
40Z=£3000
50A=10;B=10
60IF Z?1=255 END
70DO Z?1=A/255
80Z?2=A;A=A+B
90Z=Z+3+LEN(Z+3)
100U. Z?1=255
110?18=£30;OLD
```

Listing 3. Exits from the Editor

The only proviso is that the program must be written outside the Editor, so that it ends with £OD, £FF. Listing 2 adds the 04 which the Editor needs as a terminator, and the Editor display will show two back-arrow terminators. Don't delete these two ever, or the whole mechanism will fail.

A dummy program of one line could be created in Basic and transferred to the Editor. This would allow all program writing to be done using Editor facilities.

I suppose the same technique could be used on a Word Pack, except that the routines would have to be auto-run from disc, and I'm not quite sure where you would in fact store them. The Word Pack 'Q' command appears to have been an attempt at this kind of feature, but all that copying back and forth did cause some problems.

I am sure lots of you are sitting on little routines and ideas of this kind. You probably think they are too simple to be of interest. As here, though, a neat application is frequently as valuable as an original piece of programming. The actual program is only a tool. To use my favourite (over-worked) analogy: there is a finite limit to the useful alternative shapes of a hammer, but someone who can find a new use for a hammer is pretty clever.

£5 VIRTUAL MEMORY IN ATOM BASIC

My question in the September '85 Forum about how to run Basic subroutines from disc under the control of Basic has elicited two identical solutions. One is from John Cozens of Reading, and the other, from Malcolm Constantine of East Grinstead.

They each get a fiver for coming up with the answer, which makes use of the subroutine labels in Basic.

John's solution is shown in listing 4. The two programs in listing 5 should be saved on disc as OLAY 1 and OLAY 2 before running listing 4.

```
100GOS.b
110?£38E=£82;?£38D=3
120REM sets 38D/38E to
PAGE+3
130*LOAD OLAY1
140*DIR
150GOS.a
160GOS.b
170*LOAD OLAY2
180*DIR
190GOS.a
200GOS.b
210END
220bP.'"Control Progra
m"';R.
```

Listing 4. Virtual memory program

Malcolm's version is almost the same, which is interesting in a way. Each overlay program is loaded in just before it is used.

```
100aREM program one
110P.$12
120P."Program One"'
130RETURN

100aREM program two
110P.$12
120P."Program Two"'
130RETURN
```

Listing 5. OLAY 1 and OLAY 2

This approach works by using the Atom's ability to execute Basic in a text space it is not pointing to, via a label call. Basic programs of up to a disc capacity in length can be executed segmentally in this way.

These are good examples of the simplicity of neat programming. The definition of the problem is usually a greater task for the programmer than the coding.

It is a pity that most published notes concentrate almost exclusively on coding for individual machines rather than on methods of defining problems.

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P20HD TECHNOMATIC 20 Mbyte Winchester Drive fully compatible with Acorn ADFS and FS III. Includes ADFS Rom. Special reduced price. — £499 (a)

P204HP TECHNOMATIC 20 Mbyte Winchester and a 80T DS floppy Drive built in a monitor stand. Includes ADFS Rom. — £849 (a)

P2041HT As P204HP but also with a 10 Mbyte tape streamer backup unit and backup utilities. Includes ADFS Rom. — £1,499 (a)

TS10 10 Mbyte Tape Streamer Backup unit with utilities. — £695 (a)

TFC10 10 Mbyte Pre-formatted Cartridge for use with P2041HT and TS10. — £19 (d)

WINCHESTER Drive Multiplexer

TWM2 for two computers.	£99 (b)
TWM4 for four Computers.	£159 (b)

***Details on Technomatic Winchesters** on page 6*

SECOND PROCESSORS

Universal 2nd Processor	£75 (b)
TORCH ZEP100	£229 (a)
MULTIFORM Z80 TECHNOMATICs multi format Z80 system includes a FREE Pocket Wordstar + MS/DOS Read/Write Utility	£289 (b)

ACORN IEEE INTERFACE

Allows BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard. The interface can link upto 14 compatible devices. Typical applications are in experimental work in academic and industrial labs. — £265 (a)

TELETEXT ADAPTOR

Converts your computer into a teletext receiver.	£95 (b)
BBC Publications rom for enhanced Teletext Utilities.	£7.95 (d)

PRINTERS

EPSON LX86
120 cps, variety of fonts, including NLQ, bit image graphics, IBM char/graphics compatible, centronics interface standard. — £199 (a)

EPSON LX80/86 Tractor Feed — £20 (c)

EPSON LX80/86 Sheet Feeder — £49 (c)

EPSON FX800
An enhanced version of FX85. Call for details. — £329 (a)

EPSON FX1000
An enhanced version of FX105. Call for details. — £449 (a)

EPSON EX800
See details on page 5. — £409 (a)

Colour option for EX800/EX1000. — £55 (b)

EPSON LQ800
See details on page 5. — £439 (a)

EPSON LQ1000
As LQ800 but wider carriage for 136 columns. — £589 (a)

TAXAN KP815
Enhanced KP810 with 160cps and full IBM compatibility. — £269 (a)

TAXAN KP915
Enhanced KP910 with 180cps and full IBM compatibility. — £369 (a)

NATIONAL PANASONIC KX P1080	£159 (a)
STAR NL 10 (Parallel Interface)	£209 (a)
STAR NL 10 (Serial Interface)	£279 (a)

INTEGREX Multicolour Inkjet printer. — £549 (a)
Ideally suited for high res colour VDU screen dumps. Quiteness & consistent output are major characteristics. — £525 (a)
BBC Screen dump for Integrex. — £15 (d)

BROTHER HR20
A new attractively styled printer from Brother with unusually quiet operation, host of new fatures, including option to copy current documents. 8K buffer standard expandable to 16K. Parallel & Serial ports as standard. — £329 (a)

STAR POWER Type
A new low cost daisy wheel printer incorporating STAR technology for innovation and enhancements. Phone for details. See page 5 for details. — £229 (a)

JUKI 6100 Daisy wheel printer
15 cps, 2K buffer, switchable 10/12/15 cpi proportional spacing, underlining. Parallel interface. — £259 (a)

PLOTTERS

TAXAN
A3 six colour flat bed plotter — £679 (a)

HITACHI 672	£459 (a)
GRAPHICS WORKSTATION	£599 (a)

LINEAR GRAPHICS

A4S PLOTMATE	£370 (a)
A4SM PLOTMATE	£450 (a)
A3M PLOTMATE	£569 (a)

(Enquire re educational prices for the Linear Graphics plotters)

Parallel Printer Lead (1.2m).	£6 (d)
Serial Printer Lead (1.2m).	£7 (d)

PRINTER SHARERS & BUFFERS

BUFFALO PB Buffer
Parallel buffer for internal fitting to most Epson printers. Simple to instal.
PB128 (128K) — £99 (c)

PERIPHERAL & COMPUTER SHARERS
High quality switches to allow the user to switch between computers, printers, modems etc. Fully shielded metal cases. all lines fully switched.

		Parallel		Serial
3 Computers to 1 Printer	36x36-3	£69 (c)	25x25-3	£65(c)
4 Computers to 1 Printer	36x36-4	£85 (c)	25x25-4	£75(c)
2 computers 2 Printers X-over	36x36-x	£69 (c)	25x25-x	£65(c)
BBC Cable set 3 to 1 (1m ea)		£32 (d)		£34(c)
BBC Cable set 4 to 1 (1m ea)		£39 (d)		£41(c)

BBC Computer Sharer: TCS26
1 computer to 2 printers fitted with BBC cable — £22 (c)

Paper & Labels
Plain fanfold paper with microperforation:

2000 sheets 9½ × 11"	£12 (£3.50)
2000 sheets 14½ × 11"	£18.50 (£4.50)
1000 sheets A4	£12.50 (£3.50)

Labels/1000

Single Row 3½ × 1 7/16"	£5 (d)
Triple Row 2 7/16" × 1 7/16"	£5 (d)

TECHNOLINE
(24 hr viewdata system)
Tel:01-450 9764

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(close to Dollis Hill ⊖)
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For fast delivery telephone your order on 01-208 1177 using VISA/Acess Card

BARCLAYCARD VISA · Access

Orders welcome from government depts & educational establishments

All prices ex VAT.
Prices are subject to change without notice
Please add carriage
(a) £8.00 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

DISC DRIVES

Full details on page 6.
All drives fitted with MITSUBISHI mechanisms.

5.25" Single Drives 40/80 switchable:	
TS400 400K/640K	£114 (b)
PS400 400K/640K with integral mains power supply	£129 (b)
5.25" Dual Drives 40/80 switchable:	
TD800 800K/128OK	£199 (a)
PD800 800K/1280K with integral mains power supply	£229 (a)
PD800P 800K/1280K with integral mainspower supply and monitor stand	£249 (a)
3.5" 80T DS Drives:	
TS351 single 400K/640K (OFFER)	£75 (b)
PS351 single 400K/640K with integral mains power supply	£119 (b)
TD352 Dual 800K/1280K	£135 (b)
PD352 Dual 800K/1280K with integral mains power supply	£187 (b)
PD853 Combo Dual 5.25"/3.5" drive with psu.	£229 (a)

DISC DRIVE MULTIPLEXER

Full specification on page 6.

TDM2 Dual Unit: 2 computers/one drive unit	£75 (b)
TDM4 Quad Unit: 4 computers/one drive unit	£135 (b)

3M FLOPPY DISCS

5.25" Discs in packs of 10	
744 40T SS DD	£10.00 (d)
745 40T DS DD	£12.00 (d)
746 80T SS DD	£14.50 (d)
747 80T DS DD	£15.50 (d)

See page 10 for details of Special Offer

(Add £1 for library case packing)

3.5" Discs in packs of 10	
80T SS DD	£20 (d)
80T DS DD	£25 (d)

BULK DISCS

High quality unlabelled discs supplied in packs of 50 in a storage box. The 5.25" discs have the reinforcing hub rings. These discs are guaranteed for life.

50 5.25" 40 T single sided discs in lockable box.	£35 (b)
50 5.25" 80T double sided discs in lockable box.	£45 (b)
50 3.5" 80T double sided discs in lockable box.	£95 (b)
FLOPPICLENE DRIVE HEAD CLEANING KIT	
5.25" Kit with 20 disposable discs	£12.50 (d)
3.5" Kit with 20 disposable discs	£14.00 (d)
DISC STORAGE BOXES	
DB340 Lockable 40 x 3.5"	£8.50 (c)
DB550 Lockable 50 x 5.25"	£9.00 (c)
DB570 Lockable 70 x 5.25"	£11.00 (c)
DB5100 Lockable 100 x 5.25"	£13.00 (c)

MONITORS

BBC lead incl with all monitors

MICROVITEC 14" RGB Monitors
Please specify plastic or metal case.

Microvitec 1431 Standard Resolution 453 pixels	£179 (a)
Microvitec 1431AP As 1431 + composite video and sound input	£199 (a)
Microvitec 1451 Medium Resolution 653 pixels	£225 (a)
Microvitec 1451AP As 1451 + composite video and sound input	£259 (a)
Microvitec 1441 High Resolution 895 pixels	£365 (a)
Microvitec 20" RGB/PAL/Audio Monitors	
Microvitec 2030CS Standard Resolution RGB/Comp Video	£380 (a)
Microvitec 2040CS High Resolution RGB/Comp Video	£685 (a)
TOUCHTEC-501 Brings genuine touch screen operation on metal cased Microvitec monitors, incl utilities disc with starter and development programs	£239 (b)
PHILIPS 8501 See page 10 for details.	£139 (a)
TAXAN SUPER VISION 620 12" Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	£279 (a)
TAXAN SUPER VISION III 12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	£319 (a)
MITSUBISHI XC1404 14" Med Res RGB Monitor Etched dark screen brilliance and contrast control, BBC/IBM compatible	£219 (a)
12" MONOCHROME MONITORS	
TAXAN KX1201G Hi Res green etched screen	£85 (a)
TAXAN KX1202G Hi Res Long Persistence (P39)	£95 (a)
TAXAN KX1203A Hi Res amber etched screen	£95 (a)
PHILIPS BM 7502 Hi Res green screen	£75 (a)
PHILIPS BM7522 Hi Res amber screen	£75 (a)
MONITOR ACCESSORIES	
Microvitec Swivel Base (14" plastic monitors)	£20 (c)
Philips Swivel Base	£14 (c)
Monitor Stand Models B & B+	£10 (c)
Monitor Stand Master	£13 (c)
Double Tier stand Models B, B+ or Master	£24 (b)
Taxan RGB Lead	£5 (d)
Microvitec Lead	£3.50 (d)
Monochrome BNC/Phono Lead	£3.50 (d)

EPROMS/RAMS

2764-25	£2.50 (d)
27128-25	£2.75 (d)
6264LP-15	£2.80 (d)

RAM/ROM EXPANSION

ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2 8K Rams	£37 (c)
ATPL Battery backup kit	£16 (d)
ATPL Board for BBC+ (now in stock).	£31 (c)
TIME WARP Real Time Clock. Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program	£31 (d)
Time Warp with PANOS Utilities.	£39 (d)

MODEMS

(All modems are BABT approved)
See page 7 for modem specifications

MIRACLE WS2000V21/23 & BELL stds	£95 (c)
WS2000 Auto Dial Card	£27 (d)
WS2000 Auto Answer Card	£27 (d)
WS2000 SK1 Kit	£5 (d)
WS2000 DS1 disc	£10 (d)
WS2000 Data Cable for BBC	£6 (d)
MIRACLE WS4000 V21/23	£149 (b)
MIRACLE WS3000 V21/23	£295 (b)
MIRACLE WS3000 V22	£495 (b)
MIRACLE WS3000 V22 bis	£650 (b)
WS3022 1200/1200 fd	£395 (b)
WS3024 2400/2400 fd	£570 (b)
BBC Data Cable for WS3000/4000	£7 (d)

PROGRAMMINGS ACCESSORIES/SOFTWARE

See page 8 for detailed specification
Compatible with B, B+ and Master

EPROMER II while stocks last.	£89 (b)
Eprom Ryter (Epromer III) See page 8 for details.	Approx £119 (b)
MPROMER	£49 (c)
META ASSEMBLER	£145 (b)
PORTAL EPROM EMULATOR 128K	£185 (b)
PORTAL EPROM EMULATOR 512K	£285 (b)
TEAM Disassembler	£145 (b)
EPROM ERASERS	
UV1B 6 eproms, safety cutout	£47 (b)
UV1T 6 eproms, timer, safety cutout	£59 (b)

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17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

CAD/DRAWING PACKAGES

NovaCad Cad Package for B, B+ MASTER & Compact. (See page 9 for specification)

- **Tracker Ball/Mouse Version (TM)** — £79 (d)
- **TM Version plus Tracker Ball** — £119 (c)
- **TM Version plus Mouse** — £105 (c)
- **Plotter Driver Generator MOUSE** — £25 (d)
- **AMX MOUSE with SUPER ART** (pse specify B, B+ or Master) — £63 (d)
- **Super Art** — £43 (d)
- **PAGEMAKER** — £39 (d)
- **MAX** — £17.35 (d)

RB2 TRACKER BALL

- RB2 Tracker Ball with Icon Master (for B, B+ & Master) — £59 (c)
- RB2 Tracker Ball with Cursor Control Rom (for Master only) — £59 (c)
- RB2 Tracker Ball 'Stand Alone' for use with NOVACAD & other software) — £47 (c)
- Cursor Control Rom for Master — £12.50 (d)
- **MIRRORSOFT FLEET STREET EDITOR** incl VAT — £39.50 (d)

CP/M SOFTWARE

for Acorn, Torch & Multiform Z80 Processors

- **MICROPRO's** Wordstar Professional — £310 (a)
- **ASHTON TATE's** DBASE II — £310 (a)
- **SUPERCALC II** — £195 (a)

Send for details on our full range of CP/M & PC DOS packages for Business, Communications & High Level Languages.

BBC SOFT/FIRMWARE

DATABASE MANAGEMENT SYSTEMS

- **VIEWSTORE** Acorn's database with display in any mode in spreadsheet or user defined card format and powerful sort facilities. Max file size 4Mb — £37 (d)
- **STARdataBASE** A fast machine code, true random access database. Upto 4000 records/file, 69 fields. Fully menu driven, user defined record layout, very fast searches thru keysearch facility. Mailmerging from VIEW and WW. — £49 (d)
- **MASTERFILE II** Highly popular economically priced database. 17 fields per record, file size limited by drive capacity only. (40T or 80T) Please state DFS or ADFS. — £17 (d)

WORD PROCESSORS

- **VIEW 2.1** — £37 (d)
- **VIEW 3.0** — £56 (c)
- **VIEW INDEX** — £12 (d)
- **VIEW PRINTER DRIVER GENERATOR** — £9 (d)
- **DOT PRINT PLUS** Full details on page 5 NLQ rom for Epson FX/RX, MX and GLP. — £28 (d)
- **WORDWISE** — £24 (d)
- **WORDWISE PLUS** — £38 (d)
- **WYSIWYG PLUS** See page 7 for details. — £21 (d)
- **INTERWORD** (If you own a WW+ then quote your reg number and pay £39). — £46 (d)
- **SPELLMASTER** — £49 (d)
- **WORDEASE** A 16K rom based utility for WW+ — £24 (d)
- **SPELLCHECK III** A 16K rom based spellcheck program for View and WW. Contains 2000 words on the rom and 6000 (expandable to 17000) words on a disc. — £31 (d)
- **EDWORD II** (Please specify model B, B+, Compact or Master). — £43 (c)
- **EDWORD II** Applications package — £27 (c)

SPREADSHEETS

- **VIEWSHEET** Acorn's spreadsheet provides 255 cols and 255 rows and will operate in any mode. Fully compatible with VIEW and 6502 2nd processor. — £37 (d)
- **WINDOMATIC** Enhances the power of Viewsheet See page 9 for details. — £15 (d)
- **VIEWPLOT** A disc based plotting program. (To be released soon). — £22 (d)
- **INTERSHEET** The new spreadsheet from Computer Concepts with many advanced features like 105 col mode, holding several spreadsheets in memory at a time etc. — £39 (d)
- **INTERCHART** Graphics package for Intersheet — £27 (d)
- **ULTRACALC** BBC Publications very popular and well proven spreadsheet rom includes graphics utility disc. — £52 (d)
- **MINI OFFICE II (for BBC B)** A suite of inexpensive but extensive word processor, database and spreadsheet packages. (40T or 80T) — £14.75(d)
- **MINI OFFICE II (Rom)** — £48 (d)

LANGUAGES

- **META ASSEMBLER** Multi processor Assembler full details on page 8
- **TEAM DISASSEMBLER** — £145 (b)
- **MACROM** A very fast full featured macro assembler rom from 6502 and 65C02 codes, allows use of macros from library disc. Assembly can be disc to memory, memory to memory, memory to disc and disc to disc thus allowing very long source code upto the length of disc in use. About 3 times as fast as ADE and 30% more economical in memory. — £33 (d)
- **ACORN MICRO PROLOG** Logic programming language used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more friendly. — £62 (d)
- **ISO-PASCAL** Acorn's full implementation of International Std Pascal on 2x16K roms. — £48 (c)
- **ISO PASCAL STAND ALONE GENERATOR** — £30 (d)
- **OXFORD PASCAL** A fast P-code compiler and stand alone utility (40 or 80 T) Specify B or B+. — £36 (d)
- **OXFORD PASCAL** for Master — £52 (d)
- **BCPL** — £46 (c)
- **BCPL CALCULATIONS** Supports floating point, fixed point and fast integer calculations on BCPL. — £17.50 (d)
- **BCPL STAND ALONE GENERATOR** — £39 (d)
- **ACORN LOGO** — £46 (c)
- **LOGOTRON LOGO** — £55 (c)
- **BBC PUBLICATIONS OPEN LOGO** — £59 (c)
- **ACORN LISP ROM** — £39 (d)
- **ACORN FORTH ROM** — £39 (d)
- **ACORN COMAL ROM** — £43 (d)
- **MICROTEXT** A frame based authoring system from NPL for interactive computer tutoring. Disc based — £52 (c)
- **MICROTEXT PLUS** Extended Features incl extra memory, control of external devices etc. Rom based. — £229 (b)

COMMUNICATIONS

- **TERMULATOR** Advanced terminal emulator which includes VT52/100, Tektronics 4010, teletype emulations. — £25 (d)
- **COMMSTAR** A highly popular communication rom suitable for all general purpose applications (specify B or Master) — £28 (d)
- **COMMUNICATOR** A full 80 col VT100 emulation program with easy to follow screen menus. — £49 (d)
- **DATABEEB** A variety of facilities for use with WS2000 Modem — £26 (d)
- **COMMAND** (specify the modem type) — £34 (d)

COMPACT

(all on 3½" disc)

- **ARTROOM** — £27 (d)
- **FONTWISE+** — £22 (d)
- **FONT EDITOR** — £22 (d)
- **RAMROD** — £37 (d)
- **BROM PLUS** — £32 (d)
- **MACROM** — £37 (d)
- **BETABASE** — £27 (d)

UTILITIES

- **ACCELERATOR** — £49 (d)
- **ACORN BASIC EDITOR** — £22 (d)
- **MONITOR** (BBC Pub) — £34 (a)
- **BROM PLUS** — £26.50 (d;
- **SLEUTH** — £23 (d)
- **TOOLKIT PLUS** — £31 (d)
- **TOOLBOX 2** (BBC Pub) Manual — £9.50 (d); Cassette — £9 (d)
- **EXMON II** — £23 (d)
- **HELP II** — £25 (d)
- **ACORN GXR GRAPHICS ROM** specify B or B+ — £22 (d)
- **PRINTMASTER** — £24 (d)
- **PRINTWISE** — £24 (d)
- **DUMPMASTER** supports about 40 printers — £26 (d)
- **FONTWISE PLUS** — £17 (d)
- **HERSHEY FONT CHARACTER GENERATOR** — £18 (d)
- **ICON MASTER** — £29 (d)
- **MOVIE MAKER** Two Roms + Cassette — £26 (d)
- **ADV TELETEXT UTILITIES ROM** — £7.95 (d)

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ACW443 CAMBRIDGE WORKSTATION

A complete self-contained workstation with:.

* NS32016 8MHz Main Processor & 32081 FP processor.
* 20 Mbyte Winchester and one 80T Ds floppy drive.
* A detachable keyboard Hi Res RGB Monitor.
* 4Mbyte of on board Ram as standard.
* Languages supplied include: Fortran 77, Pascal, C, Cambridge LISP, 32016 Assembler & 32bit BASIC.
* Utilities on the operating system to cross link programs between different languages, utilities for porting programs to mainframes.
* **Phone for detailed leaflet.**

32016 CO-PROCESSOR

A second processor that brings genuine 'Mainframe' power to the BBC Computer.

* Interfaces with the BBC through the tube connector.
* NS32016 6MHz CPU & 32081 FP processor.
* 1Mbyte Ram as standard.
* Packaged software includes all the languages and utilities supplied with the ACW Work Station.
* **Phone for detailed leaflet.**

CPU/FP Upgrade Kit (Acorn recommended) for the Co processor for 10 Mhz operation to enable faster processing. It can be fitted at no extra charge if ordered with the Co Processor.

TIME WARP Real Time Clock with PANOS utility allows screen display of time, day and date within PANOS at anytime and allows these data to be printed on documents. Model B users will find this particularly useful.

512 CO-PROCESSOR

Brings professional software to the BBC Master.

* 10 Mhz 80186 *DOS PLUS.
* GEM Write & GEM Draw.
* 'WIMP' Environment with high quality Mouse.
* Runs many 'IBM' programs — even 'Flight Simulator'!
* Convert to/from IBM/BBC data.

DOTPRINT PLUS

A uniquely versatile NLQ ROM for the BBC Micro.

* Built-in character font generator.
* Built-in view printer driver.
* Supports microspacing for professional justification in View & with disc in Wordwise/Plus.
* True bold print as well as double width.
* 12 character pitch as standard.
* Fully variable pitch and line spacing.
* Suitable for fully **'EPSON'** compatible printers with quad-density graphics.
* **DOTPRINT PLUS** for EPSON FX/RX and compatibles.
* **DOTPRINT DUAL** for EPSON MX range.

MICROJUSTIFIED TEXT

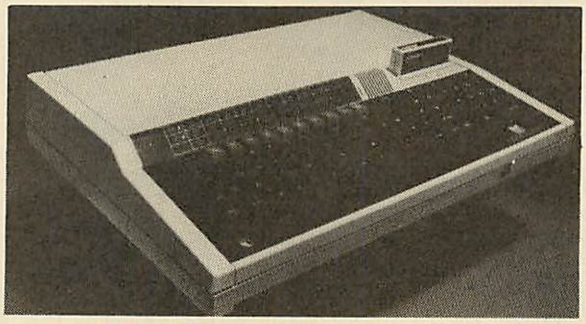
homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

NORMALLY JUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

Notice how MICROJUSTIFICATION eliminates 'stretched' spaces between words.

FREE BUNDLED SOFTWARE WITH THE BBC MASTER



We now supply the Master 128K Computer with educational software which enables immediate use of the computer.

The software package includes:

VU-TYPE DISC
The popular 'sight and sound' touch-typing tutor using colour graphics.

WORDMOVER
A program to help develop the vocabulary of primary school children

WORD PLAY
An elegant and simple program to introduce primary school children to the concept of word processing.

DRAWSTICK
A simple drawing program

LOCO MOTION
An animated game giving the player control of a train travelling around a network of some 50 screens.

PANTRY ANTICS
A fast, amusing and exciting arcade game.

Authorised dealer for
"Advanced Interactive Video System"
Please send for details on the equipment and subsidies available to schools

EPSON PRINTERS

Epson have launched a new series of printers to update the FX range. The new **FX800** and **FX1000** range combines printing versatility and superior technical features with the highest standards of reliability. The features include two NLQ fonts, 10, 12, 17, and 20 cpi, dble ht and dble width, 200 cps in draft and 40 cps in NLQ, tractor and friction as standard, IBM compatible, full graphics, 8K buffer, Parallel interface.

EPSON EX8000/1000
This range offers high speed printing to offer versatility in volume printing with speeds of 300 cps in 12 cpi mode. Four colour printing option is available for these printers.

EPSON LQ800/1000
This range with its 24 pin print head offers the highest standards in letter quality printing at high speeds while maintaining the versatility of dot matrix printers. The hex density graphics capability produces about the best printout any dot matrix printer can produce.

STAR NL10

A 80 col 120 cps printer with fine NLQ at 30 cps offers novel and innovative features. There are no dip switches to set, full control from the front console. Plug in interface cartridge simplifies adaptation to different computers. Friction & Tractor feed as standards. Epson Compatible Graphics.

NATIONAL PANASONIC KXP1080

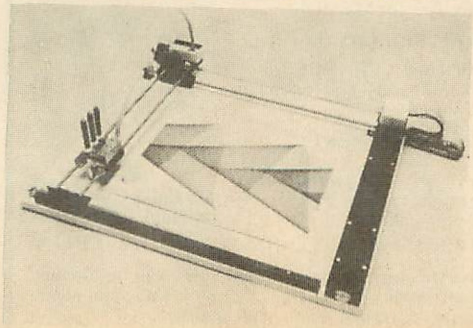
A high performance low cost printer with full character pitch feature 10, 12, 15 & 17 cpi and proportional spacing in both draft and NLQ mode. 80 column, 100 cps draft and 20 cps in NLQ. Parallel interface and Friction and Tractor feeds as standard. Epson Compatible Graphics.

HITACHI 672

* A3 four colour precision plotter.
* Serial and parallel ports as standard.
* Produces 'OHP' transparencies as well as plain paper.
* 'HP' graphics language or single character commands.

GRAPHICS WORKSTATION

A A3 pen plotter with 0.1mm resolution allows graphs, charts, architectural drawings to be plotted using the 9 predefined plotting instructions or by using a CAD package. The pen mount allows a variety of pen types including drawing pens to be used or the following range of accessories to be fitted.



OPTICAL SENSOR

This converts the plotter into a input device and offers a new range of applications: Scan or digitise a picture or a drawing to display or store. Traverse mazes and investigate methods of artificial intelligence. Reliably read bar codes.

DRILL/ROUTER

This will drill holes, machine moulds and cut complex 3-D shapes in a range of suitable materials to a depth of 16mm. Driver software is supplied on disc and an optional application program is available to interface the drill/router to our NOVACAD package.

SCRIBER

The sharp pointed scriber may be used to etch fine line drawings on surfaces such as scraperboard, wax coated copper etc. Full details on request. See page 1 for price.

All accessories available separately if required.

TECHNOLINE
(24 hr viewdata system)
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Orders welcome from government depts & educational establishments

All prices ex VAT.
Prices are subject to change without notice
Please add carriage
(a) £8.00 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

DISC DRIVES

TECHNOMATIC offers a wide combination of high quality, high performance drives to meet all needs of BBC micro users. Please see our detailed and competitive price list on page 2.

*** All Technomatic drives are fitted with quality slim line ultra low power mechanisms capable of single and double density operation and offering very fast track access and head settling times.**

*5.25" floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

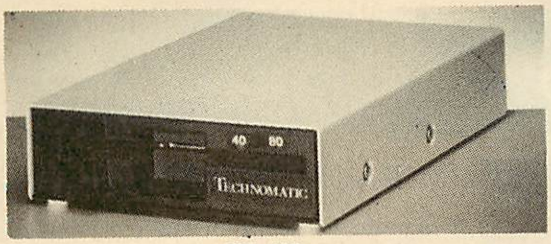
*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*The plinth version drives provide for a neat and compact system installation giving it a more professional look.

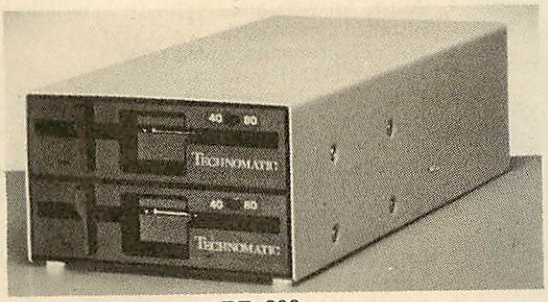
*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with suitably fused 13A moulded plug.

*PD853 Combo drive includes a combination of 5¼" (40/80T switchable) and a 3½" 80 Track Double Sided mechanisms. Complete with mains p.s.u. Ideal for software conversion for 5½" to 3½" or vice versa.

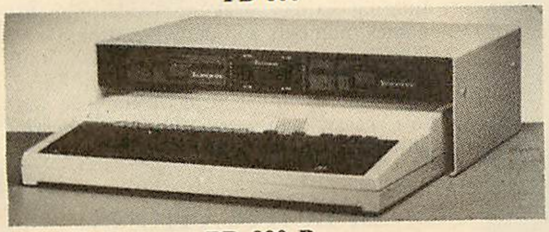
Such is our faith in Mitsubishi mechanisms that we offer a two year warranty on our floppy drives

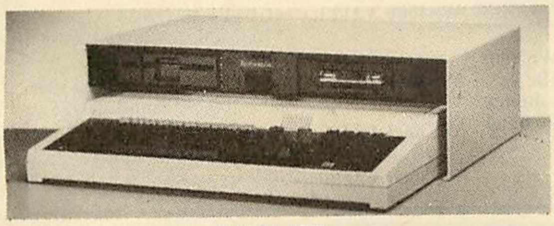


TS 400



PD 800


PD 800 P


P2041 HT

WINCHESTER DRIVES

Mass storage 20 Mbyte drives are available in the following versions:

* P20HD Stand alone.
* P204HP With a single floppy housed in a plinth version case.
* P214TS Top of the range with a 10 Mbyte back up streamer and a single floppy housed in a plinth type casing and supplied with backup utilities.
* TS10 A stand alone 10Mbyte streamer for those who are already equipped with a Winchester and a floppy drive. Utilities for backup can only be loaded from a floppy.

All models are fully compatible with Acorn's ADFS system and include a mains psu and the necessary cable connections.

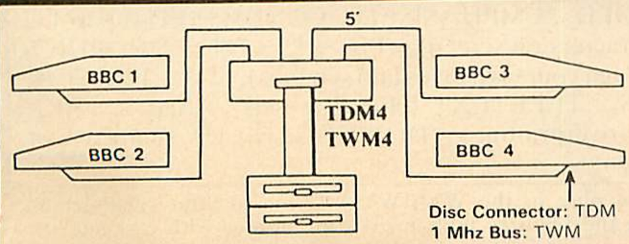
ALL TECHNOMATIC FLOPPY DRIVES NOW CARRY A TWO YEAR WARRANTY

FLOPPICLENE
Disc Drive Cleaning Kit

Floppiclene introduces a positive concept in ensuring continuous high performance of the disc drives by providing an easy and efficient method of keeping the drive heads clean. Use of disposable cleaning discs eliminates the risk always present in reuseable discs of recontamination and abrasion of the sensitive drive heads. Available for both 5.25" and 3.5" drives. Please see page 2 for prices.

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications – simply plugs into the computers drive port connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same drives, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5' of cable per outlet as standard. Mains powered.



TDM4/TWM4 Quad Unit (up to 4 computers)
TDM2/TWM2 Dual Unit (2 computers)

WINCHESTER DRIVE MULTIPLEXER

A unique addition to our hardware range that allows the sharing of a Winchester between a number of computers. The principle of operation is the same as our highly popular disc drive multiplexers and there is no need for any additional software or hardware modifications. The Multiplexers are available in two versions, a dual unit for two computers and a quad unit for four computers to share a Winchester. Multiplexers are particularly useful for accessing common software and transferring data. Care needs to be excercised for certain types of random access files.

TECHNOMATIC

BBC COMPUTERS & ECONET CENTRE
17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

MODEMS

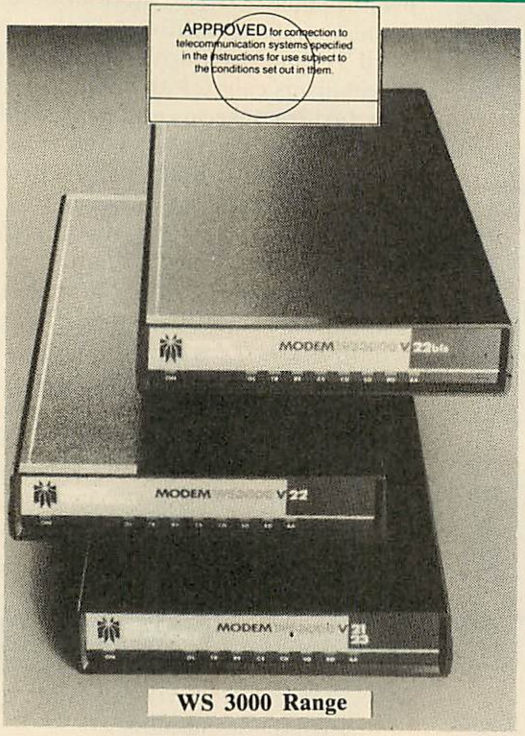
MIRACLE WS4000

* A cost effective intelligent modem that offers the best value for money bringing the world of data communication within easy reach.
* Plain English commands make it simple to use, even for the first time user.
* Latest Hayes-type protocol commands, auto dial, auto answer, auto speed seeking.
* Equalisation model in V23 for line-noise filtering.
* Many other options including upgrading to V22 and V22 bis.

MIRACLE WS2000

* A comprehensive manually switched 'World Standard' modem.
* Competitively price with a capability to be upgraded for various options.
* BT approved for V21/V23, 300/300, 1200/75 and 1200/1200 half duplex.
* Includes BEL103/113/108 standards for use outside UK.

Optional extras include (Not BT approved).
* SK1 chip set for computer control.
* User port cable.
* Auto dial Board.
* Auto Answer Board.
* DS1 disc for auto dial facilities on Commstar.



WS 3000 Range

Miracle have introduced two new models in the WS3000 series for users who require a modem for a specific use. Model WS3022 provides 1200/1200 baud full duplex operation whilst only WS3024 provides 2400/2400 baud fd only.

Please see page 2 for prices

MIRACLE WS3000 RANGE

* A professional range of intelligent modems with full BABT approval.
* Auto Answer and Auto Dial facilities installed as standard.
* HAYES protocols implemented.
* Pulse or DTMF 'tone' dialing.
* Plain English command structure simplifies the use of the modem.
* Integral parallel printer port fitted as standard configurable for both input and output for process control applications.
* A line sharing facility to differential between data and voice calls.
* Intelligent speed buffering converts 1200/1200 terminals to 1200/75
* Equalisation mode for line noise filtering.
* Internal battery back up for storing 63 names, numbers and default settings.
* Upgrade path for 1200/1200 and 2400/2400 and security encryption.
* Applications in the field of graphics and text access, high speed telex, user to user, and user to main frame.

SPECIFICATIONS

WS4000 V2123:	*CCITT V21/V23. *300/300, 600 and 1200 half duplex, 1200/75.
WS3000 V2123:	*CCITT V21/V23/Bell 103. 300/300, 600 and 1200/75
WS3000 V22:	*As V2123 and also 1200/1200 full duplex.
WS3000 V22 bis:	*As V22 and also 2400/2400.

MULTIFORM Z80

A unique Z80 2nd Processor with a 'MULTI FORMAT' capability.

includes a FREE Pocket Wordstar package

* Multiform Z80 will run most CP/M 2.2 formats on the BBC.
* 28 different formats including Acorn Z80, RML 380Z & 480Z, EPSON QX, Amstrad, Osborne etc, supplied on the library disc with the utility to create additional formats.
* Emulates the two of the most commonly used CP/M terminals, HAZELTINE 1500 and ADM-3a in addition to the Acorn VDU making installation of most of the software packages easy.
* Utility to inter convert ASCII text wordprocessed on a standard BBC and under OS/M or CP/M.
* 8271 allows single density CP/M formats whilst 1770 DFS allows both single and double density CP/M formats. Single or dual drive, 40 or 80 track format and SS or DS drives can be used providing the CP/M format matches.
* Dual drive will allow two separate formats to operate simultaneously for data transfer making it ideal for use in environment where machines with different formats are in use.
* Utility to read and write on IBM PC DOS discs available as an optional extra. Utility will also format a PC DOS disc.
* Multiform Z80 is supplied with a OS/M operating system rom, System disc and a Library disc. Please specify the DFS type and the drive format when ordering.

WYSIWYG PLUS

NEW

This new screen/printer utility not only allows you to see on the screen exactly how the text is going to appear on the paper when printed but also simplifies the printer control codes that you need to use to get the different effects.

WYSIWYG + can be used in BASIC or from within most popular word processors like View, Interword & Wordwise Plus.

The printer commands have been simplified to meaningful words so that the user does not have to either remember or keep referring to the printer manual and try to decode the commands to VDU format. For example: *ENGLARGED will display enlarged text on the screen and send the appropriate command to the printer to print in enlarged mode.

Some of the features you could see in WW + or from BASIC include:
*SUBSCRIPT, *SUPERSCRIPT, *ENLARGED, *BOLD, *EMPHASISED, *CONDENSED (up to 132 characters on screen), *PICA, *ELITE, *GRAPHICS (design your own logos and symbols), *UK, *FRENCH, *US, *TELETEXT (character sets), *BACKSPACE (for overprinting), *DOWNLOAD (new characters or fonts).

Simply plug in the WYSIWYG+ rom in your computer and utilise the features built in to your printer with ease and least bother to produce the results you know are possible but not so simple to achieve. No other single package offers this much flexibility and simplicity to get the best from your printer.

WYSIWYG + rom is supplied with a comprehensive manual.

TECHNOLINE
(24 hr viewdata system)
Tel:01-450 9764

MAIL ORDER
17 Burnley Road
London NW10 1ED
Telex:922800

RETAIL SHOPS
15 Burnley Road, London NW10 1ED
Tel:01-208 1177 Telex:922800
(close to Dollis Hill ⊖)
West End Branch
305 Edgware Road, London W2
Tel:01-723 0233
(near Edgware Road ⊖)

For fast delivery telephone your order on 01-208 1177 using VISA/Acess Card

BARCLAYCARD VISA — Access

Orders welcome from government depts & educational establishments

All prices ex VAT.
Prices are subject to change without notice
Please add carriage
(a) £8.00 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

EpromRyter
(Epromer III)
Eprom Programmer

An enhanced version of the highly successful EPROMER II providing added sophistication to the eprom programming applications on the BBC computer range. The new software also utilises the extra facilities of the BBC Master computer. The programming methods are 'state of the art' of programming technology for fast, efficient and cost effective operation.

The single rail eproms handled by the EpromRyter are:

- 2716 2732 2764 27128 27256 27512 27513 27011 2516 2532 2564 (NMOS & CMOS)
- One time eproms P27XXX, 87CXXX etc.
- Also A suffix eproms such as 27XXXA

The software is menu driven, many operations being single key. On screen help clarifying the operation being carried out. Will make the programming process very simple and easy for both specialists and novices alike.

The main features of the programming software are:

* Device, function and voltage selection from the computer keyboard.
* Continuous display of the options selected.
* All eproms upto 27512 (64K) programmed in single pass.
* Automatic Intelligent identifier support for eproms able to respond.
* Selectable programming voltage 25/21/12.5V
* 3 programming methods: Normal, Intelligent & Pulse (20 sec for a 27128).
* Serial port protocols supported.
* Intel HEX, Motorola S, HEX and ASCII protocols supported.
* DFS, NFS, ADFS and Rom Filing System Supported.
* BASIC/Machine Code programming using RFS.
* Powerful editor with input in HEX or ASCII. * Full editable 64K file.
* Block move of data within the address range.
* User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
* Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EpromRyter interfaces with the BBC through the 1 MHz bus, has a mains power supply and is fitted with a 3M TEXTOOL ZIF socket to provide consistent and reliable service for a long period.

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach."
Acorn User October 1986

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 128 (2716, 2732, 2764, 27128):
PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

MICROPROMER

An add on unit for Epromer II enabling the user to program 8741, 8748 and 8749 single chip microcontrollers. Now with the aid of cross assemblers such as META, the user can write code for the above devices and then with the aid of Micropromer program the device.

* Simple menu structure with on screen help. i.e. select a function and on the screen will appear details of the function being performed.
* Comprehensive error reporting and checking.
* Read, verify, blank check, program from 1 to the maximum byte count for the device being used at any address location.
* Support for DFS, ADFS and cassette filing systems.
* Edit data in Hex or ASCII.
* Total control via software, no switches to worry about.
* Supplied with user manual and software on diskette.
* MPROMER simply plugs into the EPROMER II ZIF socket.

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc): updates soon for most of Meta processors.

- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dissassembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

BOOKS
No VAT Carriage Code (c)

LANGUAGES
6502 Assy Lang Prog............£19.95
6502 Programming..............£13.95
8086 Book.......................£23.95
Acorn BCPL User Guide........£15.00
Acorn FORTH....................£7.50
Acorn LISP.......................£7.50
Acorn ISO Pascal Ref Manual.£10.00
Intro to COMAL.................£10.00
Intro to LOGO....................£7.50
Micro Prolog Ref Manual.......£10.00
Introduction to Turbo Pascal..£14.95
Prog the Micro with Pascal.......£8.50
The Supervisor's BBC Micro........£10.95
The UNIX Book.....................£7.50
Unix User Guide..................£19.95
Understanding Unix..............£18.45

BBC MICRO GUIDE BOOKS
BBC User Guide Acorn..............£15.00
BBC Plus User Guide................£15.00
Drawing your Own BBC Programs.......£6.95
Inside Information....................£8.95
Math Prog in BBC Basic...............£7.95
The Friendly Computer Book.........£4.50
Toolbox 2...............................£10.95
VIA 6522 Book..........................£4.50

PROGRAMMING UTILITY
Advanced Sideways Ram User Guide....£9.95
Advanced User Guide (BBC)........£15.95
Advanced User Guide..............£12.50
Applied Assemlby Language on the BBC.......£9.95
BBC Micro Advanced Programming.........£9.95
BBC Micro Ref Guide (B Smith)....£10.95
BBC Micro Sideways ROM's RAM's £9.95
Guide to the BBC ROM..........£9.95
Beginners Guide to W.P..........£7.95
Mastering Assembly Code............£8.95
Mastering Interpreters & Compilers.........£14.95
View 3.0 User Guide.............£10.00
Viewstore..........................£10.00
Viewsheet..........................£10.00
Wordwise Plus......................£9.95

SOUND & GRAPHICS:
Computer Graphics & CAD Fundementals................£9.95
Mastering Music....................£6.95

DISC DRIVE SYSTEMS:
Advanced Disc User Guide.....£16.95
Disc Book..........................£3.50
Disc Programming Techniques..£7.95
Disc Systems.......................£6.95
File Handling on the BBC........£6.95
Discovering Disc Drives..........£POA
Practical Disc File Techniques....................£5.95
Mastering the Disc Drive...........£7.95

APPLICATIONS:
Interfacing Proj for BBC.........£6.95
BBC and Small Business..........£5.75
The Software Business...........£5.50

TECHNOMATIC

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NOVACAD

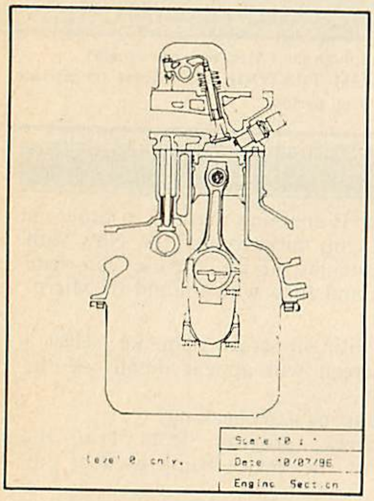
Computer Aided Draughting for the BBC Micro

"Novacad can drive a plotter to provide drawings of a high quality... Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use." **Beebug December 1986**

"Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market"." **A&B Computing August 1986**

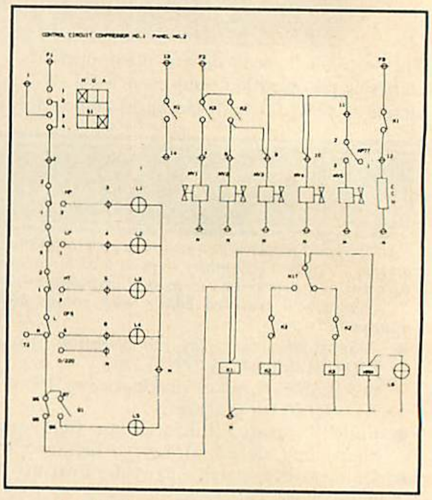
A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.



The major features of NOVACAD are:

* Simple and easy to use with logical command sequence.
* A large drawing area (approx 15 screens).
* The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
* A zoom facility allowing magnification of up to 20 times to insert finer details.
* Block copy of shapes on the screen for repetitive use.
* Text entry at any 90° orientation at any position on the screen.
* Create multi layer drawing with 8 levels available.
* Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
* Printer routine for Epson 80 and 136 column printers.
* A unique optional facility to output to any BBC compatible plotter.



MINIMUM HARDWARE REQUIREMENTS

- **Any BBC range computer with Acorn DFS.**
- **40 Track single sided single drive.**
- **Epson compatible dot matrix printer.**

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours. With shadow memory of the BBC+ or the Master, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will provide additional user memory for more complex drawings.

6502 second processor or the Turbo on the Master will also increase the drawing speed considerably.

NOVACAD

is available in two versions

*BASIC version for cursor control from the keyboard.

*T/M version for cursor control from the keyboard. Tracker Ball or a Mouse.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Preconfigured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

ROUTCAD, an optional software package for our Graphics Workstation allows for production of shapes drawn using NOVACAD in 3D on suitable material and is ideal for a range of applications including template making and model building.

NOVACAD package includes a 16K ROM, Utility disc and a comprehensive manual.

NEW WINDOMATIC NEW

All users of Acorn's VIEWSHEET spreadsheet program will be aware of its powerful windowing facility which allows the screen and/or printer to be configured in upto 10 separate windows taken from anywhere in the sheet. They will also be painfully aware of how difficult and time consuming it is to set up a required display. Although VIEWSHEET allows configurations to be saved to the media, it does not have provision for deciphering them.

WINDOWMATIC has been produced with the intention of recitifying these shortcomings and to bring out the very best from VIEWSHEET.

WINDOMATIC provides a quick and easy way to configure screen and printer allowing complicated documents and reports to be set up much more easily. It displays complete text information on all 20 windows and accurate graphic representation of the screen and printer output.

The package includes a screen dump routine for Epson printers and allows use of other printer dump packages.

The program is compatible with BBC Master, B+ and 6502 and Turbo second processors. It can be entered from VIEWSHEET by use of function keys or it may be run by loading a previously saved window configuration from disc.

The program is supplied on a disc with a comprehensive manual.

TECHNOLINE
(24 hr viewdata system)
Tel:01-450 9764

MAIL ORDER
17 Burnley Road
London NW10 1ED
Telex:922800

RETAIL SHOPS
15 Burnley Road, London NW10 1ED
Tel:01-208 1177 Telex:922800
(close to Dollis Hill ⊖)
West End Branch
305 Edgware Road, London W2
Tel:01-723 0233
(near Edgware Road ⊖)

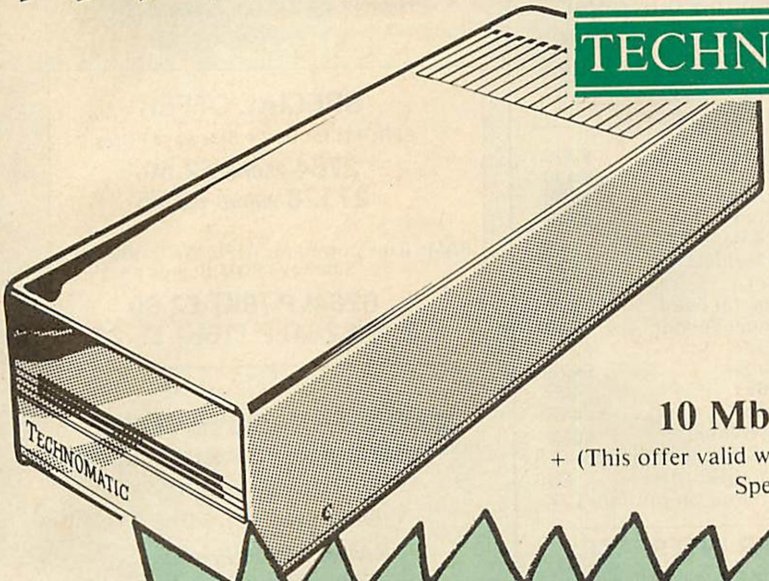
For fast delivery telephone your order on 01-208 1177 using VISA/Acess Card

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(b) £2.50
(c) £1.50
(d) £1.00

A PRICE BREAKTHROUGH

TECHNOMATIC WINCHESTERS



* Cased with power supply and cooling fan
* 1 Mhz bus extension cable
* Fully compatible with Acorn ADFS and FS III
* Fully compatible with S.J. Research file server
* 12 months warranty

10 Mbyte £399 (a); + 20 Mbyte £499 (a)

+ (This offer valid whilst current stocks last and on orders received before 27th March)
Special Adaptor for S.J Research File Server £28

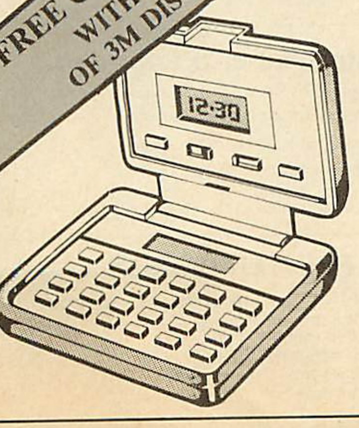
SPECIAL OFFERS PAGE

3M FLOPPY DISCS

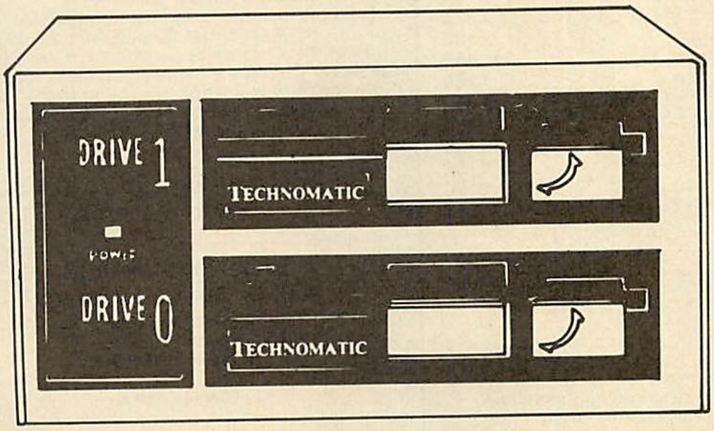
Individually Tested and Guaranteed for Life

Ever mindful of the catastrophies caused by data loss, 3M make floppy disks that are at least 32% less abrasive than the industry average. Which is why after stringent analogue and digital tests each 3M floppy disk is guaranteed error free for life.

FREE CLOCK CALCULATOR WITH EVERY 5 BOXES OF 3M DISCS PURCHASED.



3½ DISC DRIVES



* 400K/640K capacity perdrive in DFS/ADFS modes.
* Mitsubishi 80 track double sided ultra low power, fast access mechanisms.
* The drives are supplied fully cased and with cables ready for connection to a computer.
* Drives powered from the computer
* 2 years warranty.

Single Drive £75 (b)

Dual Drive £134 (b)

ORDER VIA MicroLink 72:MAG030

Watford Electronics

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774-40588 Tlx: 8956095 Fax: 01 950 8989

All prices exclusive of VAT; subject to change without notice & available on request.

Credit Card Orders (ACCESS & VISA) Tel (0923) 33383 or 50234 (24 Hours)

BBC MASTER 128K Micro	£395
BBC MASTER TURBO 4MHz	£493
512K Processor Add on Board "inc. Mouse and GEM package"	£195

BBC MASTER COMPACT

All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled softwares.

System 1	Standard Package	£385
System 1A	System 1 + TV Modulator	£399
System 2	System 1 + Green Hires Monitor	£469
System 3	System 1 + Medium Res Colour Monitor	£599

SPECIAL OFFER

FREE . . . £80 worth of Software

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and Computer Concepts' popular Interword wordprocessor ROM; WHEN YOU BUY YOUR BBC MASTER COMPUTER FROM US.

Turbo 65C102 Add-on Module	£99
BBC MASTER ET (Econet Terminal)	£315
Econet Module for the Master	£43
ROM Cartridges for Master	£13
Reference Manual I	(No VAT) £14
Reference Manual II	(No VAT) £14
Advance Ref. Manual	(No VAT) £19
64K Upgrade Kit for B+	£32
Acorn 1770 DFS Kit complete	£42
ECONET Upgrade Kit for BBC	£42
ALL ECONET UPGRADES Available	
6502 Acorn 2nd Processor package	£175
Z80 Acorn 2nd Processor package	£325
32016 Co-Processor	£999
Cambridge Workstation	£3450
ARIES IEEE Interface	£265
Acorn IEEE Interface Complete	£280
Acorn Teletext Adaptor	£95
Acorn Bitstick I	£299
Robocom Bitstick II	£759
Upgrade for Bitstick I to II	£450
Bitstick Multiplotter Driver	£65

(Securicor carriage £7)

CO-PRO ADAPTOR

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B+. With this brand new launch from Watford Electronics. You can attach any BBC Master Co-processor to the original BBC Micro. Once again Watford forges ahead with a new concept in BBC micro addons. This unique external CO-PRO ADAPTOR, is protected by patent applications.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor it supercedes.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs.
To use this addon you require a BBC model B, fitted with DNFS 1.20 or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly as if they were second processors. Master owners may use this interface to add a second Co-processor.
Watford, brings power to your BBC at only:
£50.00 (carr £5)

By popular demand our retail shop is now open until 8.00pm. every Thursday.

VARIOUS PRINTERS

EPSON FX800 Printer	£315
EPSON FX105 Printer	£430
EPSON JX-80 Colour Printer	£299
EPSON Hi-80 Printer Plotter	£229
Hi-80 Refils, set of 4 Pens	£6
EPSON Paper Roll Holder	£17
EPSON LX86 Printer	£199
EPSON LX80/86 Tractor Feed	£20
EPSON LX80/86 Sheet Feeder	£49
EPSON FX800 Printer	£315
EPSON FX1000 Printer	£425
EPSON EX800 Printer	£405
EPSON LQ800 Printer	£449
Brother HR20 Daisy Wheel	£329
Centronics Printer Cable to interface all the above Printers to BBC	£6

(Securicor carriage charge on printers £7)

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	£27	RS232 + 2K Buffer	£55
IEEE 488	£65	RS232 & 8K Buffer	£75

CENTRONICS GLP & Brother M1009 (NLQ) Printers

A major price break-through in NLQ Printers from Watford.

At last, a low cost full feature printer, supplied complete with Watford's own NLQ ROM (separately at no extra cost). Due to Watford's bulk purchasing power and low margins we can now offer this incredible printer deal direct from the manufacturers to our customers.
Features include, Epson RX Compatible commands, Near Letter Quality print, 50 CPS Draft mode, Centronics parallel interface, Single, Double & Quadruple density graphics modes, Subscript & Superscript, handle up to 9½" wide standard paper, Friction Feed standard, Low cost Tractor feed optional extra, Bi-directional logic seeking.

Special Offer ***£95*** *(carr £5)*
Tractor Feed Attachment ***£12***

PRINTER SHARERS

(Ideal for School environment)

Connect 3 BBC Micros to 1 Printer	£60
Connect 6 BBC Micros to 1 Printer	£99
PRINTER CHANGER	
Connects 3 Printers to 1 Micro (Cables extra)	£65

Acorn-Olivetti JP101 Spark Jet Printer

One of the main problems with most printers is that they are hopelessly noisy. How often have you wanted to print something late at night but not done so for fear of waking the children? Also ideal for those working in quiet environments such as libraries, etc. Silence the complaints with the serious solution from Watford at the amazing cost of only **£59**

Accepts standard 9½" Paper.

Pack of 4 refills **£10**

JP101 accepts 9½" standard fan fold paper or single A4 sheets. Tractor & Friction feed supplied as standard – print speed 50 cps.

RS232 Kit for the COMPACT £26

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS £2.50
27128-250nS £2.75

RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £2.90
2 × 6264LP (16K) £5.80

KAGA/TAXAN PRINTERS (IBM/Epson compatible)

KAGA KP815 Printer Only £239 (carr £7)

KAGA KP915 Printer Only £369 (carr £7)

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	£6
Extra long (6 feet long)	£8
Compact's Special Centronics Lead	£9
RS232 Cable	P.O.A.
IBM Parallel 1 metre Cable	£12

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Brother HR15	£3.00	-
FX100	£7.00	£5.25
FX80-MX80-FX85	£4.50	£4.95
RX80	£4.50	£4.50
LX80	£4.00	£4.50
GP80	£4.50	£4.00
GP100-GP250	£5.95	£3.95
Centronics GLP	£4.00	£3.75
KAGA KP810	£5.25	£4.75
CANON PW1080	£5.25	£4.75
Panasonic KX1080	£7.75	£4.75
Microvitec Metal Monitors	–	£5.50

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" × 11" Fanfold Paper	£7
2,000 Sheets 9½" × 11" Fanfold Paper	£12
1,000 Sheets 15" × 11" Fanfold Paper	£9
Teleprinter Roll (Econo paper)	£4

Carriage on 1,000 Sheets £1.50

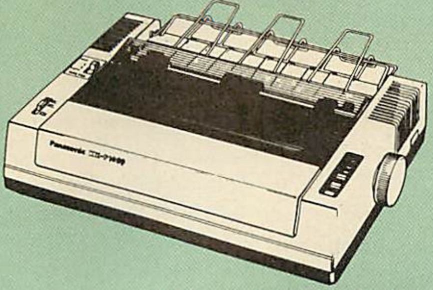
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	£5.00
1,000 90 × 36mm (Twin Row)	£4.90
1,000 90 × 49mm (Twin Row)	£7.50
1,000 102 × 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

Panasonic KX-P1080



from the prodigious Japanese Stable of Panasonic comes this fabulous new NLQ Dot Matrix Printer

Available NOW at a superbly realistic price, the KX-P1080 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy 100 cps of clear Draft text backs up the crisp 20 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

The draft text is implemented with a 9 × 9 matrix, with Near Letter Quality effected by means of an 18 × 18 matrix.

(Price inludes, FREE A 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £7)

Panasonic RS232 Interface: **£39**

Panasonic KX-P1092 Dot Matrix Printer

Similar to KX-P1080 but has 180cps speed, Draft and NLQ down loadable characters option and is IBM/Epson compatible.

Price £345

Panasonic KX-P3131 Daisy-Wheel Printer

A few months ago, we introduced the KX-P1080 to our large and discerning customer base. As a result of the enthusiastic and overwhelming reaction to this versatile dot matrix printer (see above for details), we are now extremely pleased to be able to bring you details of the fabulous KX-P3131 Daisywheel Printer, also from Panasonic. The KX-P3131 printer is the ideal printer for the home user wishing to produce clear, immaculate letters or reports.

Ideally suited to the pocket of the home user, costing not much more than a pair of disc drives, this daisywheel printer delivers flawless text at 10, 12 or 15 characters per inch. It also supports proportional print mode.

Printing at a respectable 17 characters per second, the KX-P3131 features a capacious 6 kilobytes printer buffer to swallow most printing requirements with ease. For the more demanding user, there is a 32 kilobytes printer buffer option available. Taking paper up to 13.5" wide, the KX-P3131 prints with bidirectional logic seeking, ensuring the minumum time to print your text.

Only **£218** (carr. £7)

Single Sheet Feeder	**£195**
Tractor Feed	**£90**



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

MICROVITEC 14"

- 1431 – Medium resolution as used on the BBC television computer programme **£175**
- 1451 – High resolution, suitable for word processing in mode 0 **£225**
- 1441 – High res, exceeds the capabilities of the BBC micro **£359**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£255**
- Dust Cover for Microvitecs **£5.50**

KAGA-TAXAN 12"

- KAGA KX1201G Hi-res Green Monitor **£85**
- KAGA KX1202G Long persistence Hi-Res Green Monitor **£93**
- KAGA KX1203A Ultra-Hi-Res Amber Monitor **£93**
- KAGA Vision 2 Hi-res RGB Colour monitor. Ideal for Wordprocessing **£260**
- **Kaga Super Vision 3,** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£309**
- 12" Anti-Glare Screens **£9.50**

PHILLIPS 14"

- Hi res Colour Monitor **£219**

ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

Green (New Design) Hi-res	**£69**
Amber (New Design) Hi-res	**£74**

LEADS

BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for KAGA	**£3**

N.B. carriage on Monitors **£7** (securicor)

SWIVEL BASES

for Video Monitors

By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress.

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

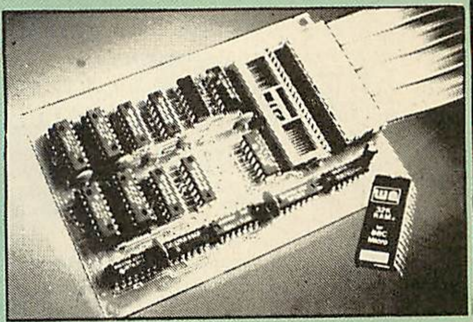
A Watford's 32K Shadow RAM Card – Printer Buffer and the much sought after, Computer Concepts' Inter-WORD, (a very powerful package) All this at an astounding price of:

Only £89 (carr £2)

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!
- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

Continued →

Mark II Light Pen

You no longer have to fiddle with the brilliance control or work in the shade as this NEW Mark II Light Pen is totally insensitive to local lighting conditions. It only operates on high frequency light from the TV or Monitor. The red LED Indicator on the Mk II pen, lights up when valid video data is available. Your program can have access to this signal allowing computer verification of target for high res drawing. The conveniently located switch on the pen body allows the computer to ignore any stray signals. Supplied complete with the sophisticated PEN-PAL Software on Cassette or Disc. Please specify.

Special Offer Price: £15

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED (BOOK)

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, Canon PW1080A or any Epson FX80 compatible Printer with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

Superb Value at **£5.95** (No VAT)

NOW WITH EXTRA FEATURES AT NO EXTRA COST Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities ten simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for four years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS).***

PRICES

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£62**
- *Acorn's 0.90 DFS Kit complete* **£57**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95** *(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£46**
- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£29**

BBC MICRO BUSINESS/ WORD/PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). Please telephone or call in at our retail shop to discuss your particular requirement and a demonstration.

EXAMPLE PACKAGE

BBC Master 128K Micro, View wordprocessor, Viewsheet, Basic Editor, Terminal Emulator, Twin 800K 40-80 track double sided Disc Drives, Zenith Hi-Res green monitor, Panasonic KX-P3131 professional quality Daisy Wheel printer, Gemini Database, Spreadsheet, Beebplot Graphics, Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, and Stock Control packages on disc with manuals.

Only £899

A Low Cost wordprocessing package: Same as above except, a single disc drive instead of a twin and Olivetti Spark Jet Printer instead of Panasonic.

Only £625

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive[What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin[What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

EXTENDED WARRANTY

Now Available
For BBC, Masters, Disc Drives & Monitors.
Write or phone for further details

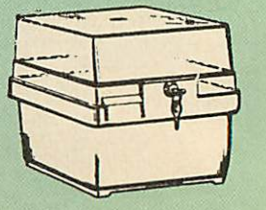
FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

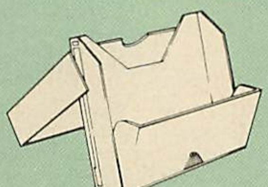
£8

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



- M35 - holds upto 50 discs **£8**
- M85 – holds upto 95 discs **£10**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our drives are of Japanese manufacture. All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

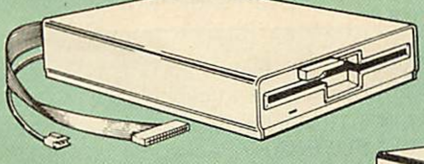
If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

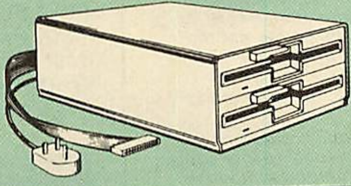
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below for single drives is for a single drive in a standard single case. Single drive in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinths! *(Turn to the 10th page of our advert for the Plinths).*

P.S. All our 5¼" Disc Drives are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect 3½" and 5¼" Disc Drive to BBC Compact £13





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £95		CS 200 £108	
400K (720K)	CLS400S £96	CLD 400 £180	CS 400S £109	CD400 £200
800K (1.44M)		CLD 800S £183		CD 800S £204

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40-80 track).

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- *10 × 5¼" S/S D/D 40 Track Diskettes* ***£10***
- *10 × 5¼" D/S D/D 40 Track Diskettes* ***£12***
- *10 × 5¼" S/S D/D 80 Track Diskettes* ***£15***
- *10 × 5¼" D/S D/D 80 Track Diskettes* ***£15***
- *Hi-Density 10 × 5¼" 1.6M D/S D/D for IBM* ***£32***
- *10 × 3½" S/S D/D 40/80 track Discs* ***£20***
- *10 × 3½" D/D D/D 40/80 track Discs* ***£24***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 × **M3** 3½" D/S D/D 80 Track Discs* ***£20***
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* ***£9***
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* ***£11***
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* ***£14***
- *3" Double Sided Discs* ***£3** each*

Special BULK OFFER on 5¼" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£46	£49	£72
● With Sleeves	£49	£52	£75

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

10 Megabytes **£1050; 30 Megabytes £1549**

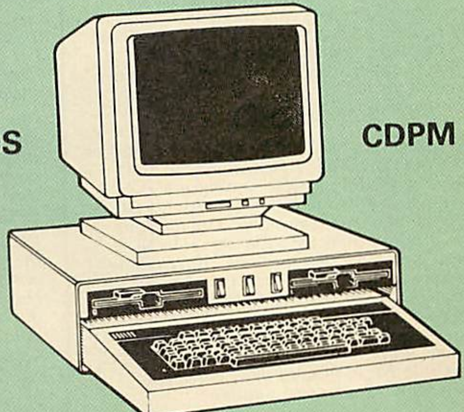
WATFORD's WINCHESTER DRIVES

- 20 Megabytes with ADFS **£635**
- 40 Megabytes with ADFS **£999**

WINCHESTER WORKSTATION

20 Megabyte Winchester, plus a Tape Streamer and a 400K Floppy Drive all housed in a plinth with cooling fan **£1499**

CDP 800S **CDPM 800S**



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £210

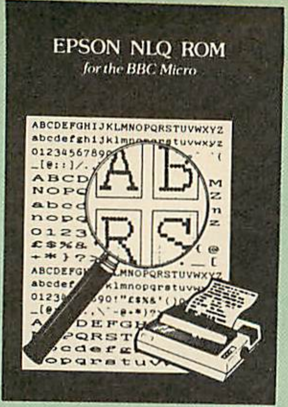
CDPM 800S for Master £225

(Securicor Carr. £7)

ACORN's Special Twin 800K Disc Drives

Specially mounted side by side in a Master Plinth. Supplied complete with Manual and Cables. Plugs directly to the Master Computer.

RRP £250 **Our Price: Only £199** (carr £7)



Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80-100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80) ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set) Standard 'pica size') Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00
(Hi-View compatible)

THE NLQ DESIGNER

(The First & still the Best)

KAGA KP810-910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted. Now BBC Master compatible.

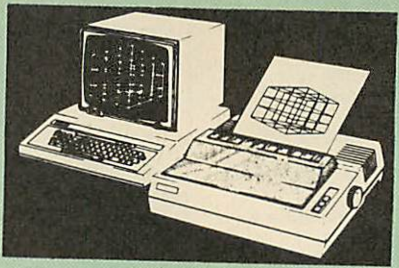
A 40 or 80 track (please specify) FONT Disc containing 9 Fonts, (Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic is now supplied FREE with every package.

(P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines(
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:
- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provides) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of ßGIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1080, Mannesman Tally etc.

Price including comprehensive manual

£25

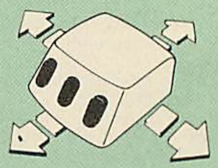
MEGABUFFER 256

This new Megabuffer 356 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:
- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £99 (carr £2)

THE AMX MOUSE



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £63 (carr £1.50)

We are giving away, absolutely **FREE**, our popular Colour Art software package worth **£15** with every AMX Mouse package purchased from us.

AMX MOUSE ONLY	**£35**
AMX DESK Package	**£19.00**
AMX UTILITY Package	**£11.00**
AMX SUPERART Package	**£39**
AMX PAGE-MAKER Pack Best desk-top publishing software. Works with keyboard, joystick and AMX Mouse	**£32**

We are giving away, absolutely FREE, PAGE-FONTS, a disc containing over 20 fonts, with every purchase of AMX PAGE-MAKER from us.

PAGE-FONTS Over 20 fonts for use with AMX PAGE-MAKER	**£9.50**
AMX 3D ZICON Disc	**£19**
AMX Database Disc	**£19**
AMX XAM Educational	**£19**
AMX MAX(A gem of desktop (ROM)	**£17**

RB2 MARCONI TRACKER BALL

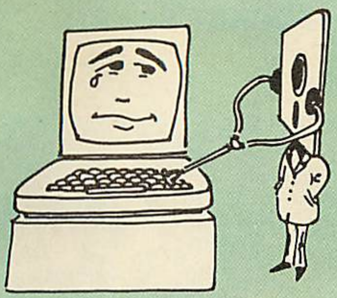
This popular unit is supplied complete with software.

Price: **£50**

FLEET STREET EDITOR

Software pack **£35**

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.
At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BBC Publication's Popular Educational Software

- Maths with a Story 1 (Cassette). 4 primary level maths programs **£10.95**
- Maths with a Story 2 (Cassette) 4 further maths programs **£10.95**
- Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs **£19.95**
- WAVES: Science Topics (Disc) CSC O Level Physics program. **£14.95**
- RELATIONSHIP: Science (Disc) O Level Biology program. **£14.95**
- BONDING: Science (Disc) O Level Chemistry program. **£14.95**
- ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program. **£14.95**
- ELECTRONICS IN ACTION (Disc) O Level program **£14.95**
- NEWTON & THE SPACE SHUTTLE (Disc) O Level program. **£20**
- ECOLOGY (Disc) O Level program. **£20**
- POLYMERS (Disc) O Level program. **£20**
- Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. **£20**
- FOOD & POPULATION (Disc) O Level program. **£20**
- MICROTECHNOLOGY (Cassette) O Level program. **£6.95**
- A VOUS LA FRANCE (2 Cassettes) A French language home study aid. **£17**
- DEUTSCH DIREKT! (Disc & Audio Cassette) **£20**

TED

The Teletext Editor Package for serious users

TED is the brand new package from Watford Electronics for the editing and creation of teletext (Mode 7) screens and displays. TED is ideal for anyone wanting to create their own Mode 7 pictures (such as game title pages), designing animated displays for shop windows, exhibitions, classrooms, etc. TED is also probably the most powerful Prestel screen editor you will ever come across.
Supplied on a special 32k package, full facilities are providing for manipulating the screen, including easy to use pixel manipulation; line, column and block buffering and copying; left and right margins; large text in a variety of different fonts (contained within the ROM device); various borders and effects templates (contained within the ROM device); line and column insertion and deletion; easy to use graphics line drawing. Those are some of the features of editor itself. In addition to this, TED contains routines for taking a number of Teletext screens and creating them into an animated sequence, with user selectable display times, repeats on a group of shows, various entry methods (how the picture is put onto the screen), routing selection (both predefined and keyboard specific), chaining of other shows, etc. Scrolls treat the Teletext sequence as a very long page with a window onto it. Supplied complete with a comprehensive manual. There are many more facilities not mentioned here, so write in for a comprehensive leaflet; you'll wonder how you managed without TED.

Price: £35

ROM-SPELL

"way ahead of any competition"



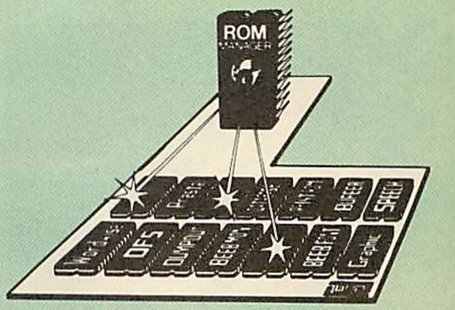
ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.
"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."
"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".
". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".
". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP-M and MSDOS, namely Spellstar and has a speed-performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".
". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".
Compatible with: View, Wordwise & Wordwise +.

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

ROM MANAGER

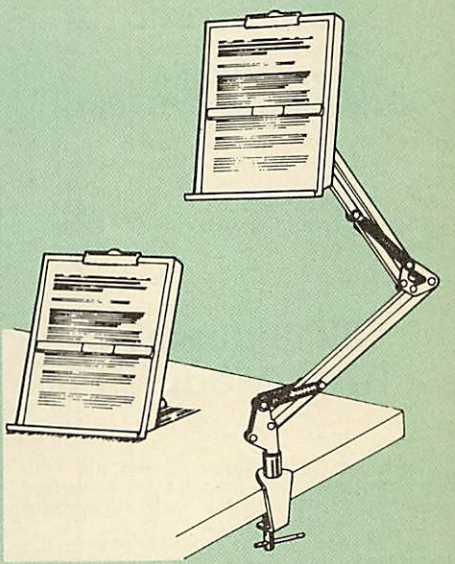


Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.
Many more facilities available.

SPECIAL OFFER £20

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234-33383

COPY HOLDERS



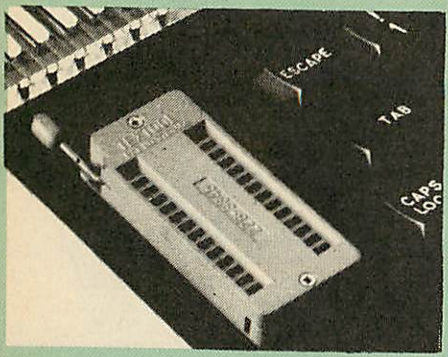
How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.
Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic rul er and a clip grip.

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

All prices in this advert are exclusive of VAT.

Continued →

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

- Complete System **£11**
- Spare Cartridges **£2.50**
- Spare Rack **£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

16K DISC RAM

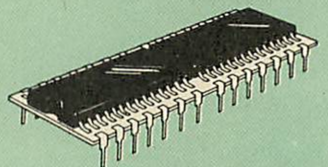
Unlike other RAM boards, this revolutionary, battery backed up, write protectable 16K sideways RAM board allows you to run from disc every sideways ROM available.
Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £32 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM



This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

Only **£28** (carr 2)
Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.
Do you require:

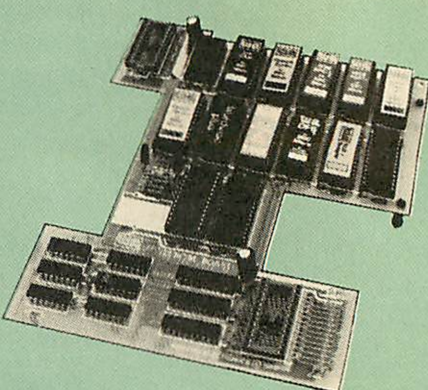
- Sideways RAM for a BBC B+ Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- An easy to use utilities disc[Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM

GRAPH PAD 2

Supplied complete with Software
£60 (Carr. £3)

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are *required*.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

NEW

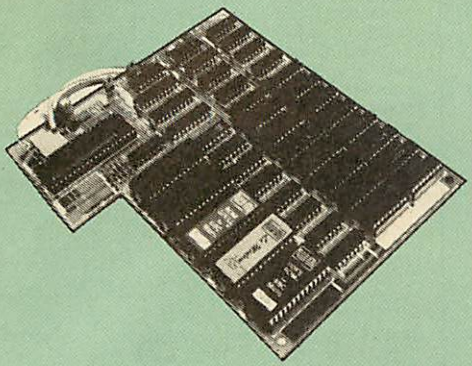
The BBC B+ Micro ROM EXPANSION BOARD

Specially designed for all BBC Plus users, this board sits in an external box, and will accept either 10 off 16k EPROMs, OR 10 off 32k EPROMs.
With the 32k EPROMs, only 5 can be 'online' at once (that's all the B+ can address, as each chip 'holds' two normal sockets worth), but you can swap between the two banks if necessary. With the 16k EPROMs, you can obviously address them all at once. An extra card can be added to permit 2 banks of 10 EPROMs to be used (again with only one bank available at once).
The ROM box, which has its own mains power supply, and connects to the BBC Plus via a specially designed card (which is a buffered card for your peace of mind) permits easy access to the EPROMs via the hinged lid. NO soldering is required for this board.

£79 (carr £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- *ROM/RAM card with 32k dynamic RAM £39*
- ROM/RAM card with 64k dynamic RAM *£52*
- ROM/RAM card with a massive 128k dynamic RAM **£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- *16k plug-in Static RAM kit £6*
- *16k Dynamic RAM for Upgrade £7.50*
- *Battery backup £3*
- *Read and Write protect switches ...... £2 each*

Complete ROM-RAM board (all options installed) £89

Le Modem



The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***
- *BT Approval applied for.*

(When ordering, please specify the version required, (BBC or Master)

SPECIAL OFFER

Price: **£74**
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£85

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Nightingale Modem without software	**Only £87**
COMMSTAR ROM package only (P&P on modem £2.00)	£29
Auto Dial Utilities Disc	£9.50

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Special Launch Price: **£75**
(Carr £3)
(Write in for full specification)

BT TELEPHONE CONNECTORS

LJU 1/4A Mini Line Master	£4.50
LJU 1/6A Mini Line Slave	£3.00
LJU 2/4A Line Master	£4.00
LJU 2/6A Line Slave	£2.50
LJU 3/4A Flush Master	£3.95
LJU 3/6A Flush Slave	£2.75
LJU 10/3A Dual Splitter	£5.50
4 Way BT Plug	£0.75

Versatile **BEEB SPEECH SYNTHESISER** Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise £24

Wordwise plus

WORDWISE PLUS £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET ONLY £37

INTER CHART ONLY: £26

Inter-WORD

Only: £42

Special Discount price for the existing Wordwise Plus owners. Simply quote your reg. number and pay.

Only: **£39**

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1 **£37**

VIEW 3.0 ROM

Price: Only **£54**

HI-VIEW **£36**
(for use with 6502 2nd Processor)

VIEW Printer Driver Generator **£9**
Please specify Disc or Cassette)

VIEWSHEET (Acornsoft) **£37**

VIEWSTORE **£37**

VIEWSPELL with 80 track disc **£29**

VIEWPLOT Disc **£22**

VIEW-INDEX **£12**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER HR15 PRINTERS

Only £10

VIEW-VIEW SHEET PRINTER DRIVER for SILVER REED
(Officially approved by Silver Reed)

Only: £10

MINI OFFICE II (disc) **£14.50**

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

النور

ARABIC ROM for the BBC Micro

The ALNOOR ARABIC ROM converts your BBC into a bilingual computer. New keytops provide both English and Arabic symbols. Two sets of Arabic symbols are provided for use in either context sensitive or insensitive operation.

20, 40 and 80 column operation. Compatible with ASMO (449). English-Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

VIEW PRINTER DRIVER ROM

(Professional facilities for demanding users)

View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

Access / BARCLAYCARD VISA

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234-33383

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8
P.S. This includes the Acorn 6502 & Z80.

A give away at . . . **Only £29**

Please specify 40 or 80 track disc when ordering.

ARIES CORNER

Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20: the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) socket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

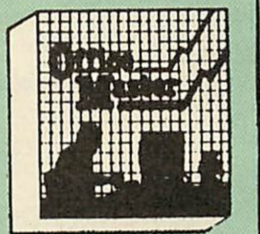
THE ARIES RANGE HARDWARE REQUIREMENTS

Aries B-32 & BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 & BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)



OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21**
(Cassette or Disc)



OFFICE MATE

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS
- WORD PROCESSOR

DATABASE – Set up a computerised "card index" system and add records/data to the file your way. Features include search, sort, mathematical calculations, printer routines, data summaries, etc.

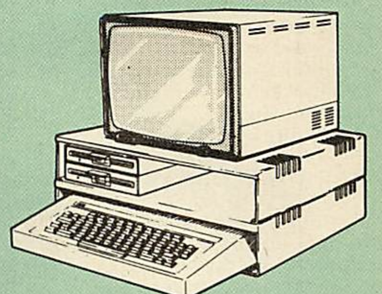
SPREADSHEET – Offers a wide range of invaluable calculation and editing features. Beebplot will take files created by Beebcalc to provide data portrayal in graph, histogram or pie chart format.

BEEBPLOT – Provides an easily assimilated visual representation of numerical data.

WORDPROCESSOR – Provides many routines found in large and expensive packages.

OFFICE MATE Only £10
(Cassette or Disc)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sofisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degredation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

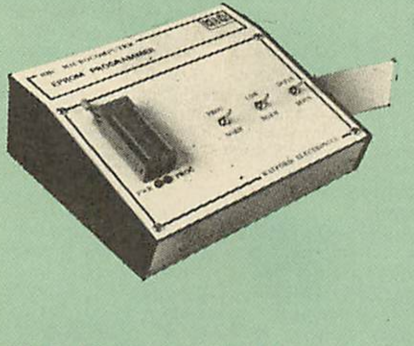
The most powerful machine code monitor for the BBC Micro **£24**.

Continued →

BOOKS (No VAT on Books)

15 Hrs Word Processor Using BBC	£3.95
30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development System	£7.50
6502 Machine Code for Humans	£7.95
6502 Reference Guide	£9.95
68000 Assembly Lang. Programming	£19.95
68000 Machine Code Programming	£13.00
68000 Programming the	£22.95
6809, Programming the	£16.95
Art of Music Graphics	£14.95
A User Guide to Wordwise Plus	£9.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£16.95
Advanced BASIC ROM User Guide	£9.95
Advanced User Guide for BBC	£15.95
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Adventure into BBC BASIC	£6.95
Applied Assembly Lang. for BBC	£9.95
Assembler Routines for the 6502	£7.95
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Language Programming on the BBC & Electron	£8.95
Basic ROM User Guide	£11.95
Basic User Guide for BBC Micro	£10.00
BBC B Compendium	£5.95
BBC B+ User Guide	£14.95
BBC BASIC for Beginners	£7.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Micro & the small Business	£5.75
BBC Micro ROM Book	£10.95
BBC Master 128 High Flyer	£10.95
BBC Micro Advanced Ref. Guide	£10.95
BBC Micro Disc Companion	£8.95
BBC Micro File Handling on	£6.95
BBC User Guide	£10.00
BBC Software Projects	£6.95
BBC Wordprocessor Beginners Guide	£7.95
BBC Within the Micro	£13.95
BCPL User Guide	£14
Complete FORTH	£6.95
CP-M-86 User's Guide	£19.95
CP-M Bible	£16.50
CP-M Handbook with MPM	£9.95
CP-M Plus Handbook	£13.95
CP-M Soul of	£16.50
CP-M The software BUS	£8.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£9.95
Disc System for the BBC Micro	£6.95
Exploring FORTH	£6.95
FORTH on the BBC Micro	£7.50
Functional Forth for the BBC Micro	£5.95
Guide to BBC ROMs	£9.95
Graphs & Charts on BBC Micro	£7.50
Hackers Handbook - New	£6.95
Interfacing & Robotics on BBC	£15.95
Into View	£4.50
Introduction to COMAL	£9.50
Introduction to LOGO	£6.95
Introducing 'C'	£9.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£17.95
ISO-PASCAL Reference Manual	£9.95
LISP 2nd Edition	£14.95
LISP, A Beginners Guide to	£10.95
LISP the Language of Artificial Intelligence	£9.95
Logo Programming	£9.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering Assembly Code	£8.95
Mastering CP-M	£17.95
Mastering Music	£6.95
Mastering the Disc Drive	£7.95
Master Advance Reference Manual	£19.95
Master Reference Manual Part 1	£14.00
Master Reference Manual Part 2	£14.00
Micronet Handbook	£6.95
Points of View	£6.95
Programming the 6502	£16.95
Programming the Z80	£19.95
Structured Basic	£7.95
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Epson FX-KAGA PRINTER Commands REVEALED	**£5.95**
Turtle Graphics on BBC Micro	£7.50
Using Floppy Discs with BBC Micro	£5.95
View 3.0 User Guide	£10
View Guide	£4.50
Viewsheet User Guide	£10
Viewstore User Guide	£10
Using BBC Basic	£4.95
Wordprocessing BBC Beginners Guide	£7.95
Wordstar & CP/M made easy	£7.45
Wordwise + A User Guide	£9.95
Z80 Applications	£15.95
Z80 Assembly Language Programming	£19.95
Z80 Reference Guide	£9.95

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette-disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

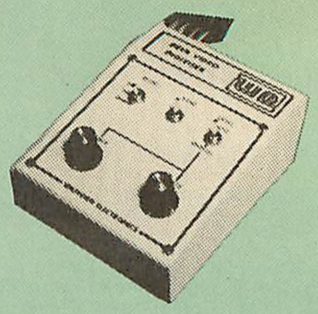
SPECIAL OFFER £69 (£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

BEEB VIDEO DIGITISER



Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the AMX Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within AMX Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£129.00** (carr. £3)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£16
Delta 14B Single Joystick	£12
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7

ROM EXTRACTION TOOL

This extremely useful tool allows you trouble free chip removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

Price: **£2**

ACORN MUSIC 500

BBC B, B+ & Master compatible.

You too can acquire this music package that has already thrilled thousands, for:

ONLY £49 *(carr £3)*

(included FREE with every unit, 'MU-500' software disc worth £6)

ATTACHE CARRYING CASE for BBC Micro

This attache carrying case is attractively finished in mottled antique brown leatherette. An ideal and safe way of carrying your BBC Micro around. Supplied with two Keys.

Price: **£13** (£2 carr.)

28 pin ZIF SOCKET (Textool) **£6.95**

28pin DIL HEADER PLUG

SOLDER type	£1.50
IDC CRIMP type	£1.95

SPARES for BBC Micro

Keyboard	£46	Keystrip	£2
UHF Modulator	£4	Case	£25
Speaker Grill	£1	Speaker	£2
Power Supply	£59	Keyswitch	£1.50

Replacement FLEXIBLE 17 way Keyboard Connector £3

8 WAY DIP SWITCHES

With these DIP switches soldered to their keyboard, any BBC B or B+ owner can take full advantage of the fast disc drives that we supply by configuring his BBC for fast disc drive operation.

Excellent value for money at **£1.00**

CONNECTING LEADS

(All ready made and tested(

CASSETTE LEADS 7 pin DIN Plug

to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
to 7 pin DIN Plug	£2.50
to 3 Jack Plugs	£2.00
6 pin DIN to 6 pin DIN Plug (RGB)	**£2.50**

DISC DRIVE POWER LEADS

Supply from BBC power supply to standard Disc Drive connector.

Single **£3.00** Dual **£3.75**

DISC DRIVE INTERFACE LEADS

BBC to Disc Drives Ribbon Cable

Single **£4** Twin **£6**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
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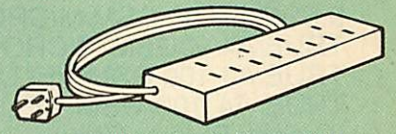
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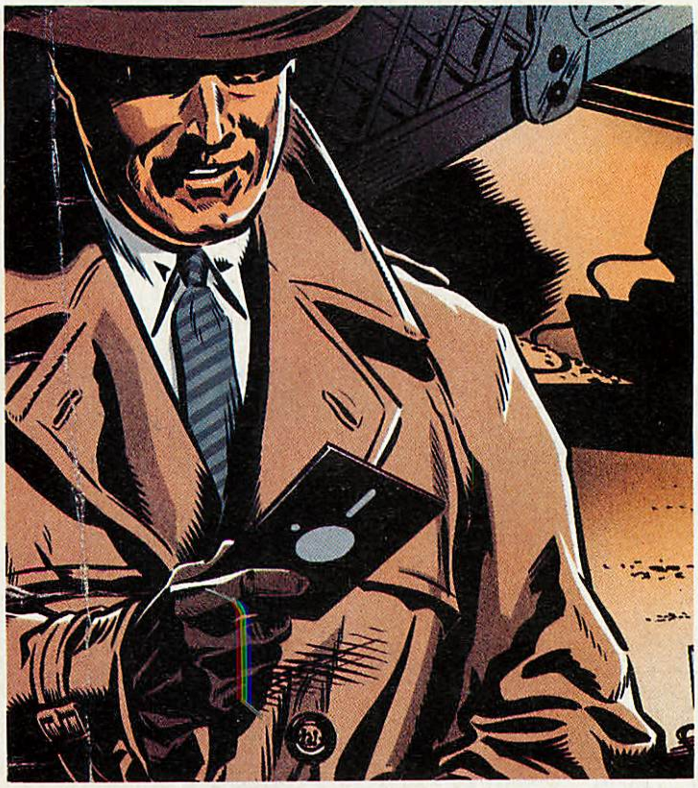


ILLUSTRATION BY MARK THOMAS

MICRO MUSIC

Save music in standard files with *Autumn* and play it as you program

David Acton

With the creation of the BBC micro all those aeons ago, it was inevitable that micro music would take off. There are many advantages in having an instrument which can also add up. The potential market was soon taken up with the releases of various synthesizer-type packages. Since then, a vast variety of software and hardware has appeared for musical owners of Acorn machines.

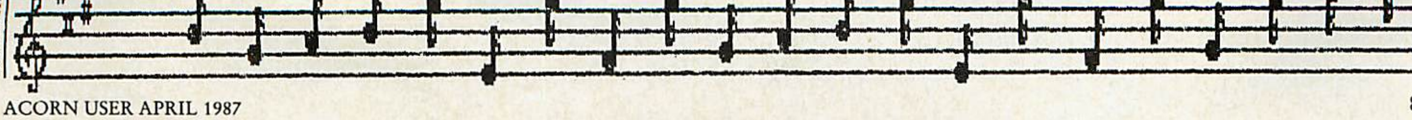
If you scan the pages of the past year's *Acorn Users* you will find reviews spanning the whole spectrum, from the Music Pen ROM from CNC (September 1986) right up to the UM12B Sequencer (February 1986). You'll also find such programs as *Tunemaker* (March 1986) which proved to be one of the most popular features we've ever carried.

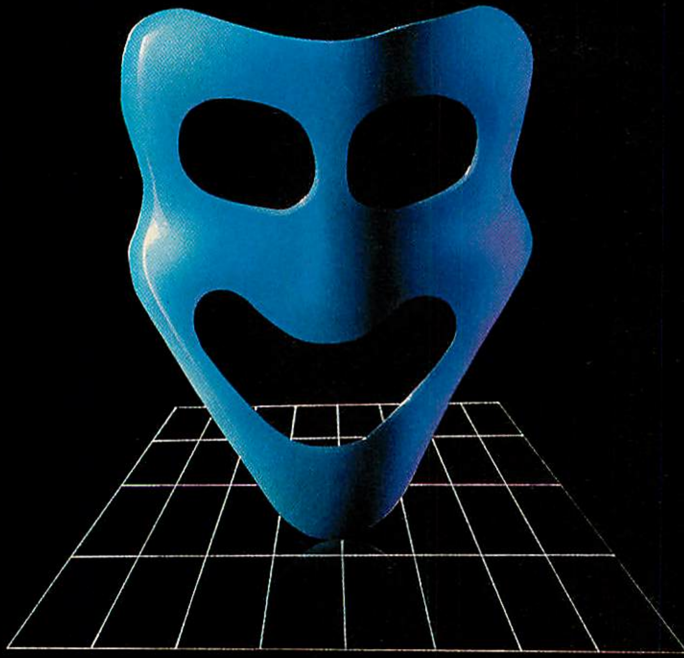
So, for the benefit of all you budding computer-musicians out there, here is an issue devoted to you! If you're new to music, I suggest you type in David Lawrence's music editor, *Theme*. You'll find his article on page 86. A few hours' playing with *Theme* should open your eyes to the world of crotchets and quavers.

For users of the Music 500 system, we present *Sunrise-Sunset*, a composition by Bob Cornford-Wood. His article, with tips on using the 500, begins on page 90. And if there's anybody who hasn't turned the page, perhaps you'd like to read on . . .

There are three distinct and easily defined types of computer-musician who read *Acorn User*. The first busily types in reams of data statements, patiently working into the wee small hours for that glorious moment of playback when all the seemingly meaningless figures metamorphose into a crisp three-part harmony. The second dreams of being a famous arcade-game creator, searching for the ideal jingle to play eternally as the hero of the piece leaps between platforms. Third, of course, is the musician true, with hardware add-ons that dwarf the little computer controlling them all.

Computers being the incompatible beasts they are, each of our three user types is limited to his or her own musical notation and standards, just as the computer-artist is very often restricted to





XOR

The Ultimate Maze Challenge

There are no random events in XOR's labyrinthine palace, and there is no premium on hand-eye coordination. You have all the time in the world to work out the precise nature of the hazards you encounter. Logical thinking, strategy and tactical problem solving are all part of the XOR experience. And XOR is not simply about finding solutions. If you can solve the entire puzzle (15 levels plus an encrypted anagram), you qualify to be a member of the Order of XOR. With a certificate and a badge to prove it.

"...this is one of the most compulsive, cunning and attractive programs I've seen for some time! .... the game is superb - a very classy original twist on the basic maze theme" A+B Computing

XOR's Features

- 15 graded mindbending mazes - each maze approximately 16 screens
- super smooth high speed scrolling
- high resolution quality graphics
- high speed or step by step replay feature
- intriguing logical problems
- interactive dynamic puzzles

XOR MAZE GENERATOR

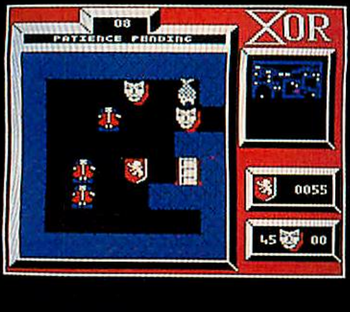
The XOR Maze Generator is a truly professional utility, in fact it's the very same generator we used to create the first collection of XOR puzzles. The package is fully menu driven and simple to use, the user simply places any predefined icons onto the maze screen. Included in the package is an ICON DESIGNER so that you can change the appearance of the game characters to baffle and delight your friends.

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whichever graphics package he or she prefers. This is a shame because it means that the only users who can share their music are those who use the same systems.

With the huge range of musical additions available for Acorn machines, what is needed is a standard way of saving music to tape or disc.

Introducing *Autumn*

In a brave attempt to put things to rights, *Acorn User* has brought forth a standard called *Autumn*, the '*Acorn User* Tune and Music Notation'. I must credit the poetic fingers of one David Lawrence for the acronym. *Autumn* is a simple method of storing notes on tape, disc or network. Before we look at *Autumn* in more detail, it is worth looking at how sound is generated in Basic.

The Basic command for generating a note is SOUND and is used as follows:

SOUND voice, volume, pitch, duration

That is, four numbers are required for each note. You may assume that four bytes would be required to store each note in an *Autumn* music file. This would make tune files rather long, so any means of reducing the number of bytes required is worth considering. Certainly a byte is required for pitch and another for duration. These are the two essentials for every note.

If we ignore special sound effects like white noise, we know that the voice parameter of the SOUND command will be one, two or three since both the BBC micro and Master have three music channels. But if we have a piece of music in three-part harmony and store it in a way such that all of the notes for voice one are in one block, all those of voice two in another, and voice three another, we can forget about specifying a voice for each note. This is what happens in an *Autumn* file. The file is divided into three parts, one for each voice. At the start of an *Autumn* file there are three pointers indicating where in the file each voice begins.

As for volume, the number specified in a Basic SOUND command is either a straight amplitude (minus 1 down to minus 15) or an 'envelope' number. As you probably know, envelopes are devices used for various sound effects and have numbers to identify them. If we always use envelope one for voice one, envelope two for voice two and so on then we can forget about

Pointer to start of voice 1
Pointer to start of voice 2
Pointer to start of voice 3
Pitch, duration
Pitch, duration
Pitch, duration

Figure 1. The simple *Autumn* file

Byte	Function	
0	Pointer for voice one start	(low byte)
1	Pointer for voice one start	(high byte)
2	Pointer for voice two start	(low byte)
3	Pointer for voice two start	(high byte)
4	Pointer for voice three start	(low byte)
5	Pointer for voice three start	(high byte)
6	Pitch, note one, voice one	
7	Duration, note one, voice one	
8	Pitch, note two, voice one	
i	255, termination pitch for voice one	
i+1	Pitch, note one, voice two	
i+2	Duration, note one, voice two	
j	255, termination pitch for voice two	
k	255, termination pitch for voice three	

Figure 2. *Autumn* file specification

Pitch=1–239	Standard pitch, next byte is duration
Pitch=0	Rest
Pitch=254	Envelope – next 13 bytes are parameters
Pitch=240–253	Reserved for future enhancements

Figure 3. *Autumn* codes

another byte. *Autumn* doesn't include a volume/envelope byte for each note. If the volume or sound effect needs to be changed for a particular voice, then that voice's envelope is simply redefined.

So an *Autumn* file in its simplest form looks like figure 1 above. As with the SOUND command, duration is specified in twentieths of a second. Pitch is in the range zero to 255 but as you will see, certain pitches have been reserved for special *Autumn* meanings. You should refer to your the User Guide for a list of pitch numbers and the notes they produce.

Rests are achieved by using a pitch of zero. So the pair of bytes (0, 4) would switch off a voice for a duration of four-twentieths of a second. Pitches of 240 upwards are also reserved. A pitch of 255 indicates that the particular voice has finished performing and wants to go home.

A pitch of 254 specifies a change of envelope. In this case, the envelope corresponding to the voice is redefined using the 13 bytes following the code byte 254.

Having defined our standard music notation, what can we do with it? Let us suppose that a budding composer has knocked up a catchy tune on his Music 500 using Ample. His friend hears the tune and thinks it would sound good as a background to the game he's just written. By using *Autumn*, it would be possible to convert the Ample file into a form in which it would be possible to play in the background of the game.

We would of course need a means of conversion to take an Ample file and transform it into *Autumn* format. We hope to be carrying Ample/*Autumn* conversion programs in a future issue of *Acorn User*, and we hope lots of computer-musicians reading this will send us conversion programs for the music system that they prefer to use. We also need a means of playing the tune on the computer as a background, but as you will see (if you read on), this month's yellow pages contain just that.

The listings

To help familiarise you with *Autumn*, five listings are on this month's yellow pages.

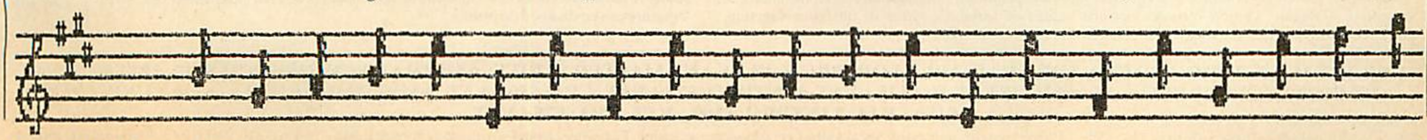
Listing 1 generates an *Autumn* file. It contains a checksum to report any errors you may make. The file it will create is called 'SAMPLE'; have a fresh disc or cassette ready to receive it. The piece consists of the opening bars from J S Bach's French Suite No 4 in E Flat. Those of you wishing to hear the remaining bars will have to invest in this month's cassette or disc. And if you really want to put your micro to shame, I recommend a recording made by the pianist Andrei Gavrilov on the EMI label.

Listing 2 is a Basic program that plays back *Autumn* files. Simply enter the name of the file, the tempo required (one being the fastest, two being slower and so on) and whether or not you want the tune repeated. Run listing 2 and enter:

SAMPLE Return
1 Return
N Return

J S Bach should then do his stuff.

It should be fairly easy to understand how listing 2 works. The three sound channels are examined in turn to see if they are ready to accept any more notes. Each channel has its own little buffer, which can store up to five notes. The Basic function ADVAL is used to examine the buffers. PROCsound generates a note. If the pitch



is 254 though, PROCenv is called, to redefine an envelope. A pitch of zero is interpreted by PROCsound as meaning a rest and a pitch of 255 indicates that the voice has finished. PROCsound marks this fact using the array called d%.

You will notice that PROCenv doesn't contain an ENVELOPE command. Instead it uses a machine code routine called OSWORD which is employed by both SOUND and ENVELOPE. Instead of using ENVELOPE followed by 14 parameters, the parameters are stored in a block of memory called env% and OSWORD is called. One feature of PROCenv to note is the use of ADVAL to see if the given voice has completely run out of notes to play. If it hasn't, changing the envelope for that voice will affect the note currently being played. Premature modulation, perhaps.

It's not much use having to write a program like listing 1 to create an *Autumn* file though. If you have typed in David Lawrence's *Music Editor* (see yellow page index, 113) then you may have noticed option three on the filing menu. This will write your tune as an *Autumn* file. And this is how 'SAMPLE' was created.

Having worked out a means of creating and playing *Autumn* files we can progress to more adventurous things. Let's start with a bit of machine code. Listing 3 performs a similar task to listing 2 but is written in assembly language. Listing 3 contains a checksum routine for error-spotting, but all going well, it will save a program called 'PLAY'. PLAY is a command and should be used with the following syntax:

*PLAY ‹name› ‹address› ‹tempo›

If you are using cassette, type */PLAY instead of *PLAY.

The name should be the filename of an *Autumn* file. The address is a memory location in hexadecimal, rather like those used with *LOAD and *SAVE. This address is where the tune data will be loaded, so you can ensure that any tune you play will not interfere with a program you have in memory. The tempo is like that requested in listing 1; one being the fastest value. So, to play the sample file using memory from &2000 upwards for example, type:

*PLAY SAMPLE 2000 1 Return

and J S Bach should do it again. What a durable chap he is – and with good reason.

The code for *PLAY is stored at &900 and zero-page locations &70 to &8F are used as workspace. The main program begins at '.play' and its first task is to interpret the parameters that you have typed after it. Should you give bad parameters, the error message 'Syntax' will appear on screen.

The pointers for each voice are set to the start of the tune by '.initpoint'. Sounds are generated by '.sound' and again, OSWORD is used. An 8-byte parameter block ('.note') is employed, two bytes corresponding to each of the parameters of a Basic SOUND command.

Envelopes are set up by '.env' and OSWORD is used once more, with a 14-byte parameter block at '.pars'. The number of free spaces in the voice's buffer is checked as in listing 2. This value is stored before hand in location 'free'.

Routines '.findspace' and '.skipspace' are used to pick out the various parameters that are typed after *PLAY.

Having taken the bold step into the realms of machine code, we can finally contemplate background music – playing a tune while another program is running.

Some of you may remember an article on playing music by 'events' from the January 1985 issue of *Acorn User* by Jonathan Lidgard (page 75). Events are a particularly useful feature of Acorn micros as they enable the programmer to stop whatever the computer is doing for a few moments (in this case fractions of a second), do something completely different, and then carry on as if nothing had happened. If you are not familiar with how events work, but think you might be interested, I suggest you get your hands on an *Advanced User Guide* and try studying chapter 12.

Having written *PLAY, we can make just a few changes and additions to achieve the same effect as Jonathan's program. The lines to change are given in listing 4 on the yellow pages. Once you have entered, checked, saved and run listing 3, add the extra lines of listing 4 and save the program with a different name.

A revised checksum is included for safety, but if you haven't made a mistake, the machine code program *EVENT will be saved on your tape or disc.

The syntax for using *EVENT is much the same as *PLAY. You have to be careful once you have used *EVENT. If you use it while a tune is playing in the background, some interesting events may ensue. Should anything untoward happen, just press CTRL-Break and try again. To play the sample tune in the background type something like:

*EVENT SAMPLE 2000 1 Return

Again, cassette users should type */EVENT. Listing 5 tests *EVENT. With the sample tune playing in the background, it proceeds to produce some (by now, famous) recursive squares.

If you have written a program for a game, you could, in fact, play a tune in the background in a similar way. And of course, because the tune data is stored as an *Autumn* file, you can avoid having to work out the pitch value of each note. Simply use the *Music Editor* (see David Lawrence's article on page 86) to create your tune and then save it as an *Autumn* file using option three of the *Music Editor*'s filing menu.

Play your part

If you're a budding musician and programmer, and like the idea of *Autumn*, why not contribute? What we'd like to see are programs to convert other types of music file to and from *Autumn*. Any other programs that make use of *Autumn* files will also be of interest.

The formal layout of an *Autumn* file is given in figure 2. Figure 3 lists the code bytes which are currently defined. Remember that codes 240 to 253 are available for you to define. So you might like to use a code to indicate a passage is to be repeated for example.

If you don't think your programming skills are up to scratch, why not send us an *Autumn* file? We'd like to hear your compositions, and share them with other music enthusiasts. Don't forget that all published contributions will, of course, receive payment according to quality, as will any we carry on our monthly disc and cassette. (But we'd all do it for the love of music, I hear you sing.)

Programs, tunes and comments should be sent to: *Acorn User* Music File, c/o Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF.

Happy music-making!

Turn to the yellow page index on page 113 to find David Acton's Autumn listing.

VARIATIONS ON A THEME

Compose a three-part symphony on a BBC micro with our easy-to-use music editor, *Theme*

David Lawrence

How could a special music issue go by without a music editor of some kind? Many people may have typed in our *Tunemaker* program (March 1986) and constructed some simple tunes, probably running into some of its limitations. *Theme* (The Music Editor) is essentially *Tunemaker 2*, and overcomes most of these problems.

Theme allows you to create tunes using the three sound voices, displaying all three on the screen at the same time for easy editing. It also caters for 'envelope' changes, key signatures, instant playback of all three voices and long-term storage of your masterpieces. The first two are the main improvements over *Tunemaker*, in which you could only use one voice and could not change notes once they had been entered. With *Theme* it is simplicity itself to enter even complicated pieces of music.

Using *Theme*

To use the editor, type in listing 1 and 2 on the yellow pages. When you have entered both listings, type CHAIN "MUSIC" to load and run *Theme*. The computer will assemble a piece of machine code, set up the user defined graphics and envelopes used by the program and chain the editor.

When it has loaded, you will be asked to enter the key signature – the number of sharps or flats at the beginning of the music. If there are none, just press Return. Otherwise, enter the number of sharps or flats (one to five) followed by S for sharps or F for flats, eg, enter 2S for two sharps (D major). The screen will clear and you will be presented with the main editor screen (see figure 1), consisting of the three staves on which music can be entered, a status line at the top and a message window in the bottom right-hand corner.

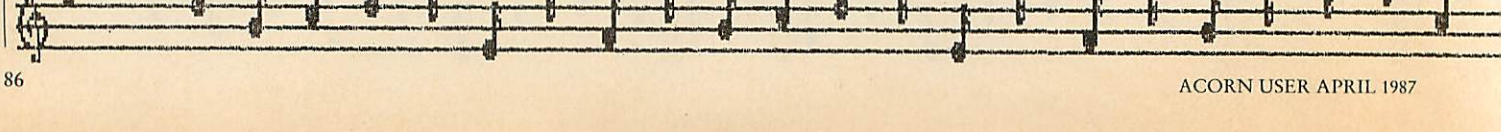
The staves have both treble and bass clefs and will also contain the sharps or flats in the key signature, if relevant. Each stave represents a voice and, to start with, each contains one note. The edit cursor is positioned in the top left hand corner (this is note one of voice one). The cursor represents the range of pitches available in the editor (four octaves, from two octaves below middle C to two above). Although key signatures are catered for, neither time signatures nor bar lines are, and hence all sharps and flats must be included every time they occur.

The four grey cursor arrow keys on the right of the keyboard (along with Shift and Control) move the cursor. Use the left and right arrows to move forwards and backwards one note at a time, one screen (eight notes) at a time, or to the beginning and end of the music. Use the up and down arrows to move the current note up and down the stave (ie, change its pitch), and to move the cursor up and down the screen (ie, to the other voices). See table 1 for a full list of control keys.

Notes of different lengths can be selected with the function keys. The note lengths available vary from a demisemiquaver to a semibreve. Dotted notes are obtained by selecting the appropriate 'un-dotted' note and pressing the full stop. Pressing full

Cursor left: move cursor left
Cursor right: move cursor right
Cursor up: increase pitch/envelope number
Cursor down: decrease pitch/envelope number
Shift cursor left: move left one screen
Shift cursor right: move right one screen
Shift cursor up: move cursor up screen (to different voice)
Shift cursor down: move cursor down screen (to different voice)
CTRL- cursor left: move to beginning of music
CTRL- cursor right: move to end of music
f0: demisemiquaver)
f1: semiquaver)
f2: quaver) With Shift, gives
f3: crotchet) corresponding
f4: minim) rest
f5: semibreve)
f6: envelope marker
S: accidental sharp
F: accidental flat
N: accidental natural
O: cancel accidental
.: switch on/off dotted note
Return: sound note and move on
1–9: select tempo
Tab: play music
Space: stop playing
Delete: delete current note
I: insert before current note
@: filing menu
P: dump screen to printer

Table 1. Control keys for *Theme*



stop again will remove the dot. Accidentals can be added using S for a sharp, F for a flat, N for a natural and O to remove any accidental. Rests are obtained by pressing Shift along with the appropriate function key, ie, for a crotchet rest press Shift-f3 (or 'Shift-crotchet').

When you are happy with the length and pitch of a note, press Return. This will 'sound' the note, move the cursor right and will give you the next note to edit. This note will be exactly the same length and pitch as the last one. To edit this note (or any other) simply use the up and down cursors to change the pitch, the function keys to change the length, as before. Gaps can be left at any point on a stave (ie, there can be fewer than eight notes on a page).



Figure 1. The main editor screen

Envelope A: loud piano
Envelope B: middle piano
Envelope C: quiet piano
Envelope D: loud sustain
Envelope E: middle sustain
Envelope F: quiet sustain
Envelope G: loud slow fade
Envelope H: quiet slow fade
Envelope I: slow vibrato
Envelope J: fast vibrato
Envelope K: 'plink'
Envelope L:)
Envelope M:) Put your own definitions
Envelope N:) here after checksum is
Envelope O:) OK (currently all zero)
Envelope P:)

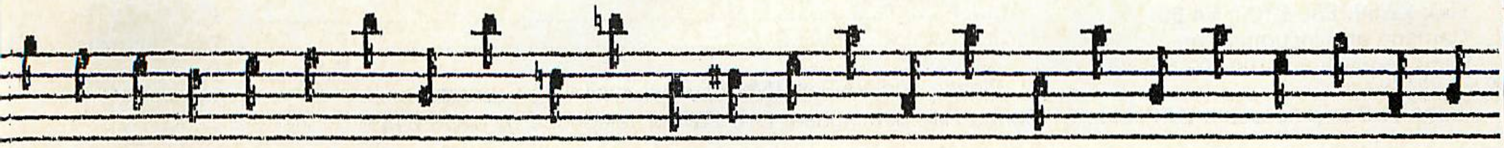
Table 2. Built-in envelopes

This enables you to line up notes correctly.

If you put a note in that you didn't mean to, move the cursor over it and press Delete. Note that you can't delete the first note in any voice. Notes can be inserted by

PROCinit: Sets up all variables and arrays
FNgetkey: Inputs key signature
FNdouble(s$): Prints s$ in double height
PROCflash(s%): Turns text cursor on/off
PROCwindows: Sets up screen windoes
PROCscrn: Draws empty staves
PROCalter(key$,nk%): Alters pitch values due to key signature
PROCpage(p%): Draws page p% of the music
PROCstave(st%): Draws stave st%
PROCkeysig: Displays key signature
FNnumb(c%): Prints number of notes in voice c%
PROCcurs(st%,no%): Draws a cursor on stave st%, note no%
PROCl(ln%): Draws a horizontal line at ln%
PROCsl%(ln%): Draws a short horizontal line at ln%
PROCnote(st%,no%,pi%,du%,co%): Draws a note of pitch pi%, duration du% in colour co% on stave st%, note no%
PROCrest(st%,no%L%): Draws a rest length L% on stave st%, note no%
PROCd: Redraws lines behind a deleted rest
PROCshowe(st%,no%,num%): Shows envelope marker on stave st%, note no%
PROCgetvals: Gets pitch and duration of current note
PROCedit: Main edit routine, get key pressed, etc
PROCdo: Execute procedure according to key pressed
PROCleft: Move cursor left note/page/music
PROCright: Move cursor right note/page/music
PROCup: Increase pitch/envelope number
PROCdown: Decrease pitch/envelope number
PROCnewenv(in%): Add in% to envelope number and display
PROCgetnote: Get note length and display
PROCgetrest: Get rest length and display
PROCnewnote(np%,nd%): Erase old note and display one pitch np%, duration nd%
PROCnextone: Sound note and move on to next note
PROCplay: Play music
PROCsound(v%,p%,c%): Play a note on voice v%, pitch p%, duration d%
FNfindend(s%): Find last note in voice s%
PROCaccident: Display specified accidental
PROCdot: Add/remove dot from note
PROCdelete: Delete current note
PROCinsert: Insert before current note
PROCsort: Redisplay current stave after delete/insert
PROCfile: Filing menu
PROCsave: Save current music
FNname: Input a filename
PROCload: Load new music
PROCfinal: Save current music in *Autumn*
PROCwrenv(d%): Writes out envelope d% in *Autumn*
PROCwrnote: Write a note to a file
PROCtempo: Change tempo
PROCenvel: Insert an envelope marker
PROCdump: Dump screen

Table 3. Functions and procedures



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moving the cursor onto the note *before* which you want to insert, and pressing I.

To play the music, press Tab. Press Space to stop. The tempo (speed) can be varied by pressing a number between one and nine (not while the music is playing).

Theme allows you to change the envelope that a voice uses as it plays. All voices are initially assigned envelope number one. To change an envelope move the cursor to the point at which you wish the change to occur (note that an envelope change takes up space so insert a space if necessary) and press f6. The letter A will appear between the bass and treble clefs. This corresponds to envelope one (B is two, C equals three, and so on.) To change to a different envelope, use the up and down cursor keys. A list of envelopes currently available can be found in table 2. If you wish to change any of these envelopes, the data can be found at the end of listing 1. The envelope marker can be deleted with Delete or changed to a normal note or rest with the appropriate function key.

Pressing P will perform a screen dump. Replace the routine in DEF PROCdump if you wish to use your own dump. Finally, the number of notes in each voice (excluding gaps) and the current page are displayed at the top of the screen. There are just over 60 pages, each with eight notes, giving you about 500 notes in each voice.

To save your music or load a previously saved tune press @. On a Master Compact, press Shift–0. You will be presented with a short menu of five options: 1 Save, 2 Load, 3 Final, 4 Exit and 5 Quit.

Option 1 will ask you for a filename and save the music in a form that can be loaded back in, using option 2. This means that the key signature, the accidentals and any gaps you left are preserved, so when reloaded the music will look the same. Note that saved files are all the same length regardless of how many notes you entered.

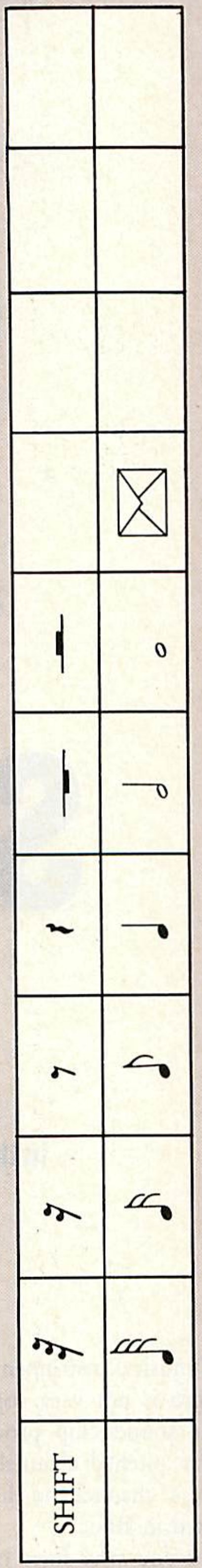
Option 2 will ask you for a filename and load that file. Once loaded, you will be returned to the editor at the beginning of voice one. Option 3 will ask you for a filename and save the music in the *Acorn User* Tune and Music Notation (or *Autumn*). Files saved in this form cannot be loaded back into the editor! This may seem funny, but an *Autumn* file is totally self-contained and can be played by a simple Basic procedure or a short machine code program (both on the yellow pages). For full details of *Autumn*, read the article starting on page 81.

Option 4 returns you to the editor and option 5 quits the program. That completes the description of the music editor and should be enough to get you started on your next symphony.

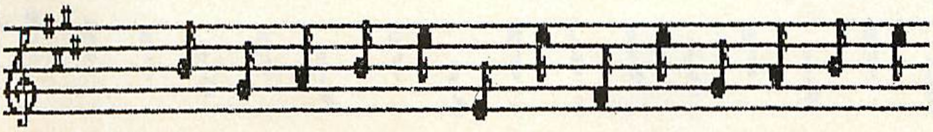
Turn to the yellow page index on page 113 for details of where to find the Theme listings and how to enter them.

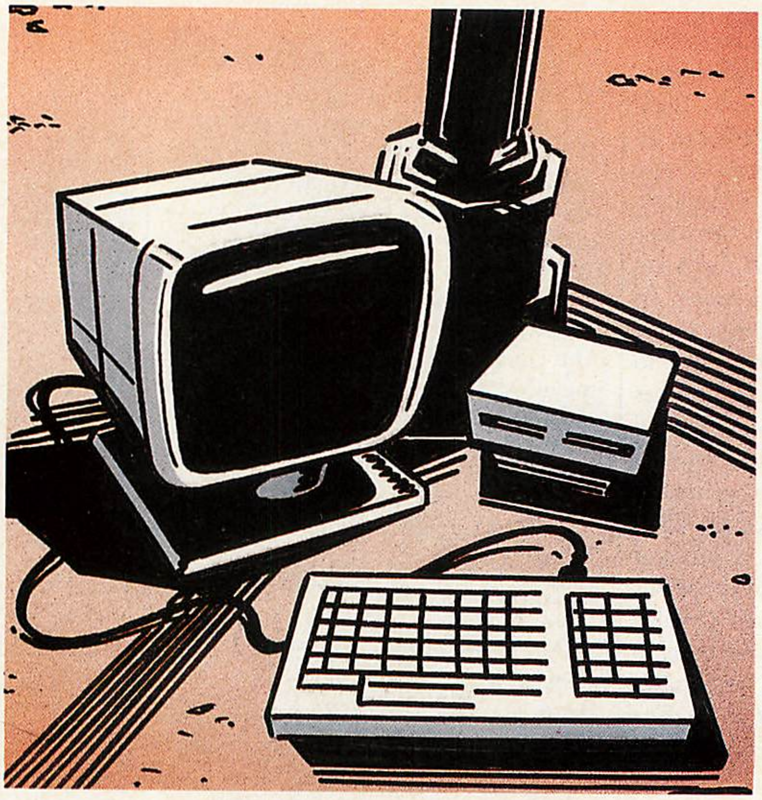
N%: Current note number
P%: Current page number
S%: Current stave number
T%: Tempo
ad%: Address of current note
c1%: Start of voice 1
c2%: Start of voice 2
c3%: Start of voice 3
co%: colour of current note
ct%: True if Control is pressed
du: Duration of current note
mem%: Memory usage for each voice
nd%: New duration
nk%: Number of sharps or flats
nn%: Old note number
notes%: Number of notes in each voice
np%: New pitch
pgs%: Number of pages in each voice
pi%: Pitch of current note
pp%: Old page number
sh%: True if Shift pressed
ss%: Old stave number
key$: S = sharp, F = flat, N = natural
k$: Key pressed
name$: Name of file to save/load
nkey$: String of ASCII codes for note lengths
rkey$: String of ASCII codes for rest lengths
ln2: LN 2 (= 0.69314)
E%(): Current envelope numbers for each voice
P%(): Note pitches
a%(): Key signature
ac%(): Accidentals
c%(): Pointers to start of each voice
ch$(): Characters for notes
d%(): Flags set when voice has finished playing
m%(): Markers for end of each voice
n%(): Number of notes in each voice
p%(): Pointers for playing each voice
up$(): Characters for upside-down notes

Table 4. Main variables



Function key strip for *Theme*





SING-ALONG A MICRO

Here we present a special composition written in the Ample language used with Music 500 and 5000 synthesizers

[redacted]

Bob Cornford-Wood

As a musical instrument, the BBC micro is not very sophisticated. The sound chip produces only three pitched channels plus one 'noise' channel and these have to be programmed in Basic.

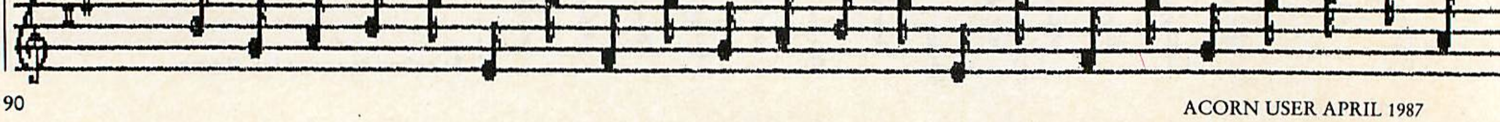
As those of you who have tried know, it's hard work producing a musical masterpiece with a language like Basic which deals with events that occur one-at-a-time rather than simultaneously, which is the case with music.

Commercial packages are available to take the programming work out of music production, but all of them have to rely on the crude sound inherent in the BBC computer.

If you still feel inclined to persevere with the sound chip, the Acornsoft book *Creative Sound* is an excellent starting point. It includes sequencer and synthesizer programs, phase music, and perhaps most impressively, a music compiler. The examples of the music compiler language provided show just what can be done with a lone BBC micro. The Ligetti *Continuum* may not be everyone's idea of good music, but it is a programming tour de force.

What has all this do so with the Music 500 synthesizer? Well, *Creative Sound*'s

ILLUSTRATION BY MARK THOMAS



authors, David Ellis and Chris Jordan, are the designers of the Music 500 and its compiled music language, Ample. When applied to a full-blown synthesizer, rather than one sound chip, Ample can make music programming a pleasure.

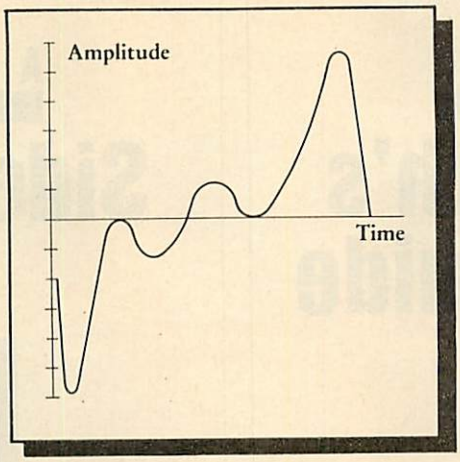
With the recent introduction of the Music 5000, and its enhanced software – the Studio 5000 'Front End', Music 500s have been available at greatly reduced prices, tempting those previously put off by either the price or by the tales of the unfriendly programming language. This latter objection has been met by the new software, and I think Hybrid Technology, makers of the Music 5000, can now expect to reach micro-owning musicians rather than just programmers.

Underlying the Studio 5000 software, however, is good old Ample, and for those new Music 500/5000 owners who are eager for help and advice, I present here a piece of music, called *Sunrise-Sunset*, which I wrote as a demo for a video soundtrack. The program is written in Ample BCE and is designed to run on a Music 500.

For those readers who are not familiar with Music 500, here is a brief summary of the facilities available to the musician. Sixteen sound generation channels are provided which must be used in multiples of two, giving in effect, an eight-voice polyphonic synthesizer. More complex sounds are available if four or more channels are assigned to a particular voice. (Of course this cuts the total number of independent voices available.) The stereo position of each channel is variable by use of the POS command. Seven placings are possible across the sound stage, from minus three (left) to plus three (right). Music is written as upper or lower case letters – depending on each note's position in the scale relative to the last note.

The pitch range available is over 10 octaves, with the actual frequency range stretching from zero to 20kHz. Pitch can be specified in units of one-sixteenth of a semitone, and fine-tuning is available in units of 0.0056Hz. This is useful for 'modulation effects', that is creating new final sounds by feeding the sound output of one channel into another.

The Ample commands 'Shift' and 'Offset' act on the pitch/frequency to create these modulation effects. 'Frequency' and 'ring' modulation, 'phasing effects' and



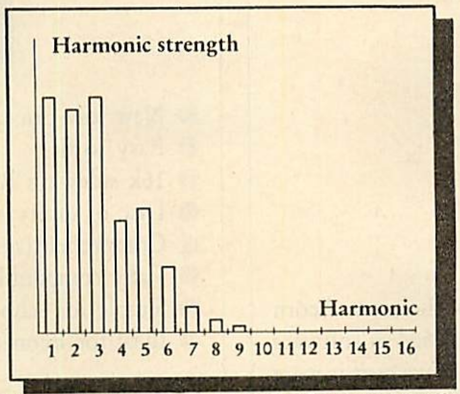


Figure 1. Waveform described geometrically (top). Figure 2 (bottom). Waveform described by the strength of a note's harmonics

'synchronisation sound' add to the range of note qualities (or 'timbres') possible.

These qualities in turn depend on the 'waveforms'. Any generated sound has a corresponding waveform and this can be shown graphically, as in figure 1 (above). With Ample, such graphs are considered to be made up of 128 points, and a timbre can be specified by computing these points. An alternative method is to specify 'harmonic' strengths. Each sound consists not of one pitch, but several; a dominant one and weaker 'harmonics' which add to the general quality. Figure 2 shows the same timbre as figure 1, but in terms of the strength of harmonics.

Using either of these methods to describe a timbre, notes are then processed through amplitude and/or pitch envelopes (not unlike Basic's envelopes), giving for instance, a hard, percussive effect, or a gentle pan-pipe effect.

Like any form of programming, personal style plays a large part in the way that the program is constructed. There are many approaches available to Ample programmers. The 'threaded' nature of the language with the facility to define 'words' to perform tasks comprising other user-defined words or pre-defined Ample words means that the building blocks exist to manipulate the hardware in almost any way you require. Also, you are able to replace the pre-defined words with your own definitions if you wish.

Sunrise-Sunset illustrates a few of the techniques available to the Ample programmer. Readers familiar with Ample may have other ways of achieving the same results, but those who are less experienced may find some useful hints.

Before describing the program, what about the music I have chosen to illustrate the facilities of the Music 500? Well, it consists of three distinct sections, the central one I shall refer to as 'The Tune'. The first and last sections use repeated phrases of differing bar lengths ('riffs') which, when combined, produce a shifting pattern of sound. Minimalist music fans may note a faint influence of Steve Reich here!

These riffs are in a sort of modal C major, but after a while they collect their thoughts and climb up to F sharp major for The Tune – this key being as far from C major, harmonically, as they can get. To give this tune a rhythmic interest (hopefully!) a few bars of 3/4 time are interspersed with the 4/4 time used throughout the remainder of the piece.

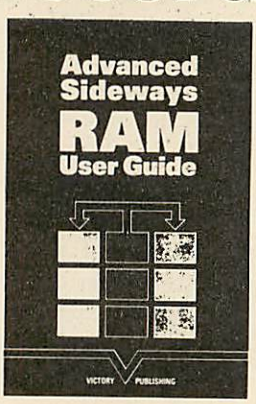
Ample has a 'bar-checking' facility to help you ensure that your note lengths add up, but it is not used here because the 3/4 bars would be rejected! The 'middle eight' bars of the central section gravitate to the key of A major (roughly) before a seemingly imperceptible change in key back to the F sharp of the start of the tune. This is repeated before things start to fall apart. During the disintegration the key falls back to the modal C major, and our riffs return, dying out one by one to leave the bass part humming away on C with a 'coloured' (or frequency modulated) G held above it.

The whole program is controlled by the word 'play'. First, waveforms and envelopes are defined by calling 'setup'. Voices are freed from any previous allocations, the correct number of players are 'hired' you might say, and the initial tempo is set. Each player in turn is given something to play, a 'score', which also tells him

RAM GUIDE

AU OFFER

Bruce Smith's RAM User Guide



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Features of the book include: 25 programs and routines demonstrating the use of sideways RAM; compatibility tables and conversion notes for the BBC micro and Electron; writing languages and interpreters; extensive indexing; and there's even a ROM formatter developed by Bruce Smith for use on commercial software, ready for you to type in and use.

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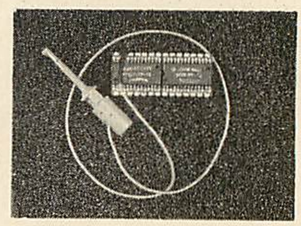
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the instrument sound to use. They start together on the Ample command 'GO'.

The waveforms are set by giving harmonic strengths (after resetting to zero), which are then converted to a geometric form using the Ample command 'WHG'. Ample does the work of converting a description like figure 2 into one like figure 1. The waveforms are then copied to the wave number specified in 'setup' with the command 'WHC'. Most envelopes are of the 'attack-decay-sustain-release' variety, rather like Basic envelopes, but 'env1' is a pitch envelope, giving a vibrato effect by using 'CYCLE'. The accompanying numbers give the repeating period of the vibrato and its frequency depth.

All sixteen channels are used in the instrument definitions, the bass part and the solo voice for The Tune having four each. '4 CHANS SOUND' turns on all channels. 'ON CHAN' indicates that the following commands relate to all the instrument's channels. Selective commands specify the channel ('1 CHAN') or set of channels ('ODD CHAN'). Wave and envelope allocations use the numbers relating to those in 'setup'. 'AMP' gives the volume, and 'POS' (where specified) the stereo position. Since our players move about, most position commands are embedded in either the 'score' words or the 'music' words.

The riffs ('riffA' to 'riffF') set the initial octave for the part. Middle C is denoted by '0:', minus numbers indicate lower pitches and plus numbers higher ones. The Ample word ',' gives the current note length (in timebase 'ticks'). A usual convention is that '48' gives a crotchet, '24' a quaver and so on. But providing the ratios remain constant, any numbers can be used. '/' gives a tied note and '|' is a bar line, used here for convenience since bar checking is not enabled, bar lines can be omitted altogether. '–' flattens the following note, '+' sharpens it (not '#' as you might expect), and '=' naturalises it, if set to a sharp or flat by the key signature.

However, 'riffD' is unusual. It forms an ad-lib part using the random generation of some note durations and the pause between repetitions. It is a good example of Ample's use of Reverse Polish Notation, or RPN for short. This is a convention used in programming languages such as Forth. It is beyond the scope of this article to explain RPN fully, but its use means that numbers and commands are entered in a different, almost reverse, order to similar commands in a Basic program.

The '#' indicates that the following character is a number operator. Thus '–' on its own is a flat sign, but '#–' is a minus sign. RPN uses 'stack operation', so '2+3' would be written as '2 3 #+', leaving the result on the top of the stack for the next word to use. In 'riffD', 'RAND?' gives our random number (in the range –32768 to 32767). This is divided by 200, leaving the quotient and the remainder on the stack. '#12' swaps these two numbers around so that the quotient comes to the top. '#12' discards this top number, leaving the remainder to be added to 10. Thus a number between 10 and 200 is assigned to the 'duration' value giving a variable pause. A similar process giving a number between 15 and 20 is used to give the note duration for the start of the phrase.

Score

We now come to the words 'score1' to 'score5'. These were the parts given to the musicians in 'play' and so must contain their instrument allocation and any changes required plus the music scores. In 'score1', 'adlibsound' not surprisingly is the instrument that plays 'riffD' described above. Since the exact timings of 'riffD' are now known, the part has been sequenced by trial and error, giving the appropriate values to 'duration' to ensure the correct entry of 'riffE' at the approach to The Tune, and the return to 'riffD' at the end.

The 'FOR()FOR' loop construction is used in these score parts to repeat the riff or section the appropriate number of times. Like most programming languages, Ample generates apparently random numbers by using a very long number sequence. It is possible to specify a starting place when reading numbers from this sequence, and by 'seeding' in this way, we can ensure that the same apparently random numbers come up every time. In 'score1', the random number generator has been seeded with the value 33 to ensure that riffD always plays the same way at each performance, '33 RAND!'.

The other score parts are constructed along more conventional lines. A word defining one 4/4 bar rest has been defined, 'barsrest', and this is used to insert a measured pause where required. The '@' sign plays in effect a zero length tied note, and its insertion explicitly finishes a musical event before a change in sound and instrument parameters. This happens where 'score2' switches from 'ins2' to 'solovoice'. The Tune components are written in three parts (B, C, and D) associated with each of score 2-5, and these are called as required with a 'FOR' loop dealing with the repeat.

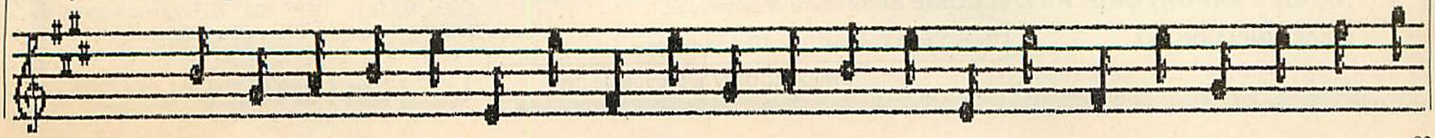
In 'score4', the final notes are played with a modified 'ins4'. Frequency modulation is called for channel one, and a frequency offset specified for channel two.

The most complex score word is 'score5'. Apart from giving the bass line throughout, tempo changes are embedded within the music score. The command 'TEMPO' affects the tempo of all players simultaneously and so all parts keep in sync as the piece slows down or speeds up.

The music parts B, C, and D associated with scores 2 to 5 are unremarkable, apart from having the key of the music explicitly set by the words 'keyC', 'keyA' and 'keyF-sharp'. If the piece were to remain in one key throughout, this could be specified in 'play' along with the tempo. But since the piece changes key these words are inserted where appropriate. Ample defaults to the key of C, but a word has been defined for this to change the signature back after F#. Without these key signatures all sharps would have to be written before each note affected. Since six notes out of the eight in the scale of F# are sharpened this would cause a lot of extra work, give more room for error, and use more memory. Linking in with the tempo change function of 'score5', 'part5D' also has embedded 'TEMPO' commands that control the 'disintegration' part of the music as it slides back to C major for the final section.

The scope for improvement on this piece is considerable! Altering the four-channel instrument sounds to just two channels will yield four extra channels for percussion parts. Changing waveforms and envelopes and the modulation controls will conjure up wholly new sounds. Unlike most computer programming, Ample programming is a creative activity in itself, so happy playing and listening!

Turn to the yellow pages index on page 113 for details of where to find the Sunrise-Sunset listing and how to enter it.



```
       .......A.......B.......C.......D.......E.......F.......G....
......1
......2                        Sheem & Distric  H.B.P. Society
......3                        ------- -------  ------- -------
......4
......5                     APR     MAY     JUN     JUL     AUG
......6 PAYMENT
......7 -------
......8    loan payment   45.55   45.55   45.55   45.55   45.55   4
......9 printin            0.00  184.50    0.00    0.00    0.00
.....10  s'tary expense   16.50    0.00    0.00   10.79    5.25
.....11 t'surer expense    5.88    0.00    4.50    0.00    0.00
.....12    room hire      12.50    0.00   12.50    0.00   12.50
.....13 ------- ------- ------- ------- ------- ------- ------- ---
.....14   total payment   80.43  230.05   62.55   56.34   63.30   4
.....15 ------- ------- ------- ------- ------- ------- ------- ---
.....16 RECEIPT
.....17 -------
.....18 sale of T shirt    0.00    0.00    0.00   68.00   84.50   5
.....19 sale of books     12.50   37.50   25.00   12.50    0.00   1
.....20 Wynne's donatio    0.00  650.00    0.00    0.00    0.00
.....21 members fees     135.00  320.00  200.00   57.00   88.00  27
.....22 ------- ------- ------- ------- ------- ------- ------- ---
.....23   total receipt  147.50 1007.50  225.00  137.50  172.50  34
.....24 ------- ------- ------- ------- ------- ------- ------- ---
.....25     net total     67.07  777.45  162.45   81.16  109.20  29
.....26 ------- ------- ------- ------- ------- ------- ------- ---
.....27
```

DOING IT ON THE SIDE

Printing out letters and programs presents no problems, but what of the wide spread sheet?

John Knight

Have you ever wished your printer was wider? One of those able to take 'professional' 14-inch wide paper? How about if your printer was as wide as you wanted and you could print the widest spreadsheet ever seen, or a program listing with multi-statement lines where each line really was one line, not several? Or you need to print text data (as opposed to graphics) that is too wide for any printer? If that has ever been your problem read on.

Normal printing is ideal for text that is long and narrow, such as program listings, letters and lists, but there are occasions, particularly with spread sheets, when your output is wide but not very long.

The following program will be ideal for those situations, it will also handle long documents but of course if your output won't fit on one piece of paper then you will have to 'cut and paste' no matter how it is printed – at least this program gives you a choice of how you go about reaching the best compromise.

This is a stand-alone program developed (initially for the *ViewSheet* user) to allow text files to be printed sideways down the page. However, to coin a phrase, its use is limited only by your imagination! As long

```
...H.......I.......J.......K.......L.......M.......N.......O.......P

   Account for:  '1985-8
   ------- ----  -------

SEP    OCT     NOV     DEC     JAN     FEB     MAR   TOTALS

5.55  45.55   45.55   45.55   45.55   45.55   45.55  546.60
0.00   0.00   99.00    0.00    0.00    0.00    0.00  283.50
0.00   0.00    8.30    6.80    0.00    0.00    0.00   47.64
0.00   0.00    0.00    0.00   22.00    3.60    0.00   35.98
0.00  12.50    0.00   12.50    0.00   15.00    0.00   77.50
---- ------- ------- ------- ------- ------- ------- -------
5.55  58.05  152.85   64.85   67.55   64.15   45.55  991.22
---- ------- ------- ------- ------- ------- ------- -------

6.00  40.50   26.00   58.00    0.00   17.50   22.50  373.00
1.25  64.00   80.00  125.00   16.00    0.00   37.50  421.25
0.00   0.00    0.00    0.00    0.00    0.00    0.00  650.00
5.00 300.00   48.00   25.00   35.00  108.00  321.00 1912.00
---- ------- ------- ------- ------- ------- ------- -------
2.25 404.50  154.00  208.00   51.00  125.50  381.00 3356.25
---- ------- ------- ------- ------- ------- ------- -------
6.70 346.45    1.15  143.15  -16.55   61.35  335.45 2365.03
---- ------- ------- ------- ------- ------- ------- -------
```

as your data to be printed can be stored in a file instead of printing and you are the proud owner of one of the many Epson-compatible printers then the rest is easy.

Getting the output into a file can be done in several ways, the obvious one is *SPOOL. The *View* family permits this but other wordprocessing programs such as *Wordwise* have a menu option to produce spooled output. The *SPOOL option however, leaves unwanted extras and so if you are using one of the *View* family the best option is to use Graham Bell's excellent spooler program, *V.ASCII* (*Acorn User* July 1986 pages 173 to 177). This pretends to be a printer driver but rather than interpret any highlight codes it strips them out and sends the text to a file that is ideal for this program. The capabilities of the program are:

Maximum input file size 20480 bytes
Maximum line length up to 20480
Page 'length' 96 lines (eight inch paper)
Printer any compatible with Epson dot graphics. Specifically ESC 'L' for 120 dots per inch, and ESC 'A' linefeed.

All non-printable characters, that is, all values below space in the ASCII sequence, are treated as carriage-return and consecutive non-printable characters are treated as one carriage-return.

Typing the program in should not present any more than the usual heartache. The major cause of problems are likely to be the use of the indirection operators '?' (in FNgetletter and FNgetbyte) and '!' (in PROCgetfile) plus the small chunk of assembler in PROCmccode. None of these is unduly complicated but they are important and crucial to the working of the program. Remember, Knight's First Law of Programming states: 'the consequences of inaccurate typing are inversely proportional to the size of the missing character – send for the disc!'

If you do type it in be sure to save it before you run it, and go easy on spaces and REMs as it's quite a tight fit.

Here are the steps you should follow to print sideways using *ViewSheet*:

1 *SHEET
2 LOAD or enter the data manually
3 Set print window to cover whole sheet
4 PRINTER V.ASCII
5 PRINT
6 Enter filename at prompt
7 *BASIC
8 CHAIN "SIDEWAY"
9 Enter filename

If you don't have *V.ASCII* then use these steps instead:

4 *SPOOL filename
5 SCREEN
6 *SPOOL

If you have a printer that can handle paper wider than eight inches then you can alter 'maxdots' in PROCsetlimits to be 120 times the width of your paper in inches, giving you more lines across the page; the value of 'maxwidth'. So any mention of 96 lines really means maxwidth.

When the program is run it will request the name of the file to print. The user can either enter the name of the file if known, or an operating system command such as *CAT, to locate the file or do other housekeeping. The operating system command is detected by the presence of the star as the first character typed. This useful facility needs careful use however, as some star commands overwrite the Basic program.

When a filename is entered the program determines whether or not the file is there

	A	B	C	D	E	F	G
1							
2				Sheem &	Distric	H.B.P.	Society
3				--------	--------	--------	--------
4							
5			APR	MAY	JUN	JUL	AUG
6	PAYMENT						
7	--------						
8	loan	payment	45.55	45.55	45.55	45.55	45.55
9	printin		0.00	184.50	0.00	0.00	0.00
10	s'tary	expense	16.50	0.00	0.00	10.79	5.25
11	t'surer	expense	5.88	0.00	4.50	0.00	0.00
12	room	hire	12.50	0.00	12.50	0.00	12.50
13	--------	--------	--------	--------	--------	--------	--------
14	total	payment	80.43	230.05	62.55	56.34	63.30
15	--------	--------	--------	--------	--------	--------	--------
16	RECEIPT						
17	--------						
18	sale of	T shirt	0.00	0.00	0.00	68.00	84.50
19	sale of	books	12.50	37.50	25.00	12.50	0.00
20	Wynne's	donatio	0.00	650.00	0.00	0.00	0.00
21	members	fees	135.00	320.00	200.00	57.00	88.00
22	--------	--------	--------	--------	--------	--------	--------
23	total	receipt	147.50	1007.50	225.00	137.50	172.50
24	--------	--------	--------	--------	--------	--------	--------
25	net	total	67.07	777.45	162.45	81.16	109.20
26	--------	--------	--------	--------	--------	--------	--------
27							

A section of the double-height database illustrated on the previous pages printed normal height

and if so what size it is. The whole file is then loaded into memory, and printed from there. This does, of course, introduce a limit on the size of file that may be printed but removes the need for repeatedly accessing the file. The program next asks if you want the output in double-height characters, these are much easier on the eye (compare the diagrams above and on the previous page), but reduce the page length by a half.

Printing then proceeds using successive letters from each line, the first of each line, then the second from each line, and so on. If more than 96 lines are present then lines 97 onwards are printed to the 'right', ie, further down the paper. The printing is done in much the same way as a graphics screen dump would be done, using not the printer's character set but the characters belonging to the BBC micro.

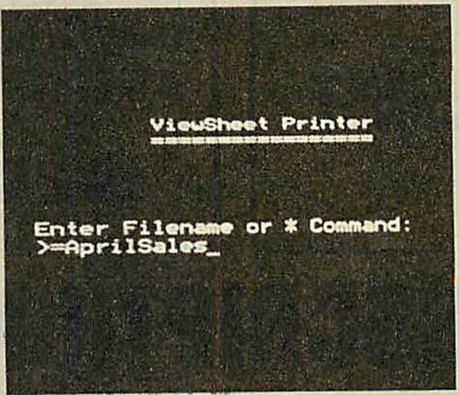
One interesting benefit which accrues from this is that the pound sign, other ASCII oddities and any user defined characters, appear exactly as they should and not as some bizarre shape dreamt up by the printer manufacturer.

When the file is complete the program asks if there are any more to be printed and if there are returns to the point where you tell it what the filename is.

The program

Those of you keen to get on with the program can now proceed to the yellow pages index, as I shall describe exactly how the program works.

After the file has been selected and loaded as described above, the program deals with it in chunks of 96 lines. The reason for this is the choice of the '960 dots per line' mode and the use of 10 dots per character, including two dots for vertical space between the letters. What actually happens is that by scanning the text in memory, a table of pointers is set up, each one indicating the place in memory where the next line begins. If more text remains after this then the variable 'morelines' is set to 'TRUE' and the rest of the lines are scanned later.



Program asks for filename

The bit that turns the letters sideways is in PROCreadfile. This procedure goes through the table of line pointers requesting the next letter for the current line. If this line has been finished, ie, the next character in the line has a value less than 32, the function invoked (FNgetletter) returns a value of 32 (the ASCII code for space). If the line has not been finished the appropriate ASCII code is returned, the pointer is changed to point to the next letter, and the count of lines still active is incremented. This is repeated until the count of active lines reaches zero.

All the codes returned from FNgetletter are passed into the machine code routine (CALL vducode on line 860) via the A% variable, one of the four resident variables that provide access to the registers in the 6502 processing chip.

This routine calls OSWORD 10, the operating system subroutine that returns the dot pattern of any character in an array of eight bytes. These eight bytes are then sent to the printer which is then followed by two zero bytes to give a space between the lines. Driving the printer in graphics mode like this means that data is sent to the printer in a fixed format. What happens is that the Escape 'L' command in line 830 tells the printer to expect (n2 * 256) + n1 numbers (in our case 960) and to use those numbers to control which pins of the print-head to fire. So if a carriage return was sent amongst the 960 numbers it would only result in the pattern for the number 13. The carriage return and line feed codes still need to be sent however, and this is done at the end of each group of 960 bytes.

Currently the program expects the printer to do automatic line feeds with each carriage return sent. If this is not the case for your set-up then change the two VDU 1,13 commands in DEF PROCreadfile to VDU 1,13,1,10.

Finally, error handling is deliberately simple – whenever I type in someone else's program I usually want to change the way errors or the Escape key are handled, so I have only included a simple 'ON ERROR' command for this.

Turn to the yellow pages index on page 113 for details of where to find John Knight's sideways printing program.

You could also save yourself time by buying the monthly listings cassette or disc. See page 136.

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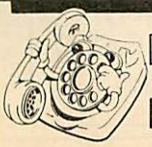
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PRESENTING POINTER PICTURES

The Compact has a pointer ROM as standard software, which can be used to draw sprites

David Atherton

In your Master Compact desktop manual, you have already seen the moving pointer, and also the moveable pictures such as the calculator. In this article, I will be telling you how to use the pointer and moving picture objects (known as sprites) in your own programs. You will not need to know anything other than a little Basic to write these programs, and I have given you an example in the yellow pages.

A standard set of sprite pictures is supplied with the machine.

To use the pointer and sprite systems you will first need to load some files into memory. Prepare a disc as described in the box below and start it up with Shift-Break. All the relevant files will load in. You are now ready to try any of the techniques or run any of the example programs mentioned in this article.

Making a sprite work disc

1 Run the Welcome disc to the point where the pull-down menus are displayed
2 Press CTRL-Break
3 Insert a formatted disc, and type *MOUNT
4 Type: *SRSAVE SPRITER 8000+2400 W Q
  *SRSAVE PMFS 8000+2000 X Q
  *SPRITE
  SSAVE WIMPSPR
5 Type *BUILD !BOOT, and then:
  0001 *SRLOAD SPRITER 8000 WQI
  0002 *SRLOAD PMFS 8000 XQI
  0003 *SPRITE*
  0004 *SLOAD WIMPSPR
  0005
then press Escape
6 A disc suitable to run the programs described in this article is now prepared. Press Shift-Break to initialise it



Programming the pointer

You have seen on the Welcome desktop that the pointer can be moved around the screen with cursor keys, joystick or mouse. It can also be moved with an analogue joystick on a Master 128 or a trackerball. Separate commands exist to select each of these devices. Actually, the mouse (anything AMX compatible) and trackerball (anything Marconi RB2 compatible) commands are identical. These devices are both connected to the joystick port on a Compact, and the user port on a Master 128, and although their wiring is slightly different, the software can work out which device is connected. Don't assume from this that a Compact trackerball is available yet. I've not seen one, although like mice, it is only a question of rewiring the plugs.

To select a device, the relevant pointer system star command is given (see box above) either without a parameter, or with 1 as the parameter. So to select the cursor keys the command would be *KEYS or *KEYS 1. To change to joystick, two commands would be needed: *KEYS 0 to deselect the cursor keys and *DIGITAL 1 to select the joysticks. The pointer code will get confused if you don't deselect the old device before selecting the new one.

The commands to move the pointer round the screen are fairly straightforward. Having selected the device you require, the single command *POINTER, or *POINTER 1, will display the pointer on screen. Another command *FX22 is needed to allow the pointer to move. Touch the controls on the device you have chosen, and the pointer will move. No further program lines are needed for this – the pointer ROM controls it automatically.

So far so good! We have a pointer

Pointer system star commands

KEYS 0/1 Select (1) or deselect (0) cursor keys as pointer drivers
DIGITAL 0/1 Select or deselect joystick as pointer driver
JOYSTICK 0/1 Select or deselect analogue joystick as pointer driver. This is only relevant where the pointer system is used on a Master 128
MOUSE 0/1 Select or deselect mouse as pointer driver
POINTER 0/1/2 0 = Remove pointer
  1 = Show pointer
  2 = Update pointer, but don't show it
TRACKERBALL 0/1 Identical to *MOUSE. Software detects which device is present
TSET ‹X› ‹Y› Move pointer directly to X, Y on screen
SETPAL Implement stored colours on screen palette
FX 163,243,n n=0...7 Sets background colour in store:
n=8...15 Sets foreground colour in store
n=64 Step background colour on one
n=72 Step foreground colour on one

moving round the screen. You'll notice when moving the pointer that it accelerates as it moves, and it does not corrupt text and graphics as it passes over them. This is all taken care of in the pointer ROM. The next step is to tell the rest of the program where the pointer is. This information is supplied by Basic's ADVAL function. ADVAL (7) gives the horizontal position (the X-axis) and ADVAL (8) gives the vertical position (the Y-axis). When you know where the pointer is, you have to write the appropriate code to check what else is at that point, and act accordingly.

Listing 1 on the yellow pages gives a practical example of all this. The set up procedure draws some random boxes. The pointer is then activated, and can be moved round the screen. If you press Copy (or Fire), the colour at the pointer tip is reported. I have deliberately kept the example simple to make the programming clear. You should be able to adapt this 'point' method for a number of purposes. If you change the program to run in mode 130, there are 16 possible colours to point to. Listing 2 is another application for the pointer, a program menu. When you press Copy or Fire, the program prints out which number you have selected. Of course, it could easily be modified to chain another program or call a procedure.

When writing your own programs using the pointer ROM, there are a few restrictions you should know about. You should never print on top of the pointer. If you are printing further data, it is best to turn off the pointer temporarily, and then turn it on again. Also, the pointer should be off during a screen clear or mode change.

Programming with sprites

The sprite system allows you to design and edit sprites using a full screen grid. Let's look at this first. If you have set up the sprite system as instructed, you'll have the desktop sprite set already installed. Type MODE 128 and then *SEDIT 15. The screen should look like figure 1. You are now in the sprite editor and can alter this sprite to be anything you want. The cursor keys will move the cursor (as shown in the bottom left corner) around the grid. There are a lot of keys to employ in the editor (see box right), and you would be wise to make up a keystrip like your *View* strip. Figures 2 to 4 show more sprites.

In the example given, which is a picture of a ROM chip, only part of the picture is shown enlarged. Moving the cursor to the edge of the visible grid will force other parts of the picture to come into view. The patterns are altered by changing the colour of each cell.

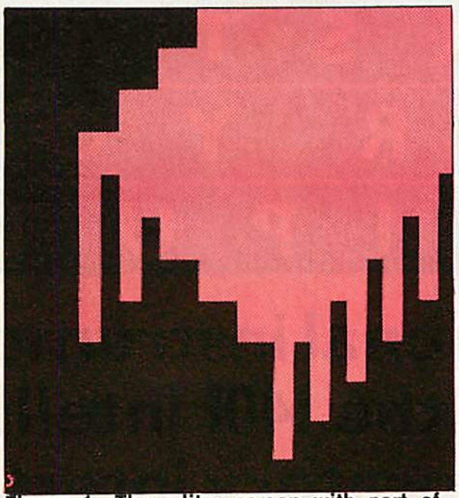


Figure 1. The editor screen with part of sprite 15, a ROM chip, displayed

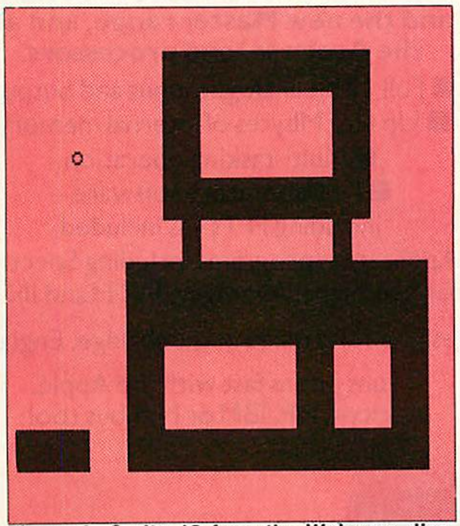


Figure 2. Sprite 13 from the Welcome disc

Sprite editor control keys

Cursor keys Move around grid
Shift cursor keys Move eight cells
CTRL cursor keys Move to sprite edge of sprite
f0 Pen up/down
f1 Fill row
f2 Fill column
f3 Extend column
f5 Insert row
f6 Insert column
f7 Mirror vertically
f8 Mirror horizontally
Shift–f3 Reduce column
Shift–f4 Reduce row
Shift–f5 Delete row
Shift–f6 Delete column
Return Plot pixel in current colour
1 to 9, A to F Select colour (current colour shown on screen)
Delete Plot a pixel in colour zero (background colour)
Copy Plot a pixel in colour seven (text foreground colour)

While working in two colour modes (0/128 and 4/132), you can set cells just using the Delete (for black) and Copy (for white) keys. The sprite size can be altered using extend and reduce commands. Also, insert and delete position the sprite in the cell space.

If you are going to animate your sprite you can save yourself a lot of work at a later stage by including a background border around it. This must be at least one cell on top and bottom, and on the left and right, eight cells in 80 column modes, four cells in 40 column modes, and two cells in 20 column modes.

The example program listing 3 will animate any sprite, but it is a bit flickery. If you have left the border around your sprite, you can delete the GCOL statement (line 80) and the second plot command (line 150), and the smoothness of the animation will improve remarkably.

To use the editor in other modes, and thus with colour, select the mode first, and then select your sprite for editing. The editor will continue in that mode and you will get automatic access to the extra colours. There are four colours in modes 1/5/129/133 and 16 in modes 2/130. The editor also works in mode 4/132, but not in the text-only modes. Colour is selected by pressing a number key zero to nine or letter key (A to F corresponding to 10 to 15). Return actually fills in the cell. Note that sprites produced in a certain screen mode can be displayed and used only in that mode. The editor is left by pressing Escape, which confirms the changes to the particular sprite that you have been editing.

Having produced one or more masterpieces, you'll want to save them. You can only save all the sprites in one go, so check what you've got in memory. The easiest way to do this is to type:

```
REPEAT : INPUT I% : V
DU 23,27,0,I% : PLOT &ED
,640,512 : UNTIL FALSE
```

Keep typing sprite numbers, and pictures or a 'doesn't exist' message will appear. Any surplus sprites can be deleted by *SDELETE, then *SSAVE "PIX" will save the sprites to disc file called Pix. To use those sprites again, type *SLOAD PIX.

Next we display the sprite. Actually you've already used the display commands in the above line. VDU 23,27,0,I% will select sprite I% for display, and PLOT

&ED,X,Y displays sprite I% with its bottom left-hand corner at X,Y on the screen. Instead of VDU 23,27,0 there is a command SCHOOSE followed by a number. Typing the following:

*SCHOOSE 0
PLOT &ED,0,0

would place sprite zero at the bottom left of the screen. There must, of course, be a sprite zero defined or loaded in, and the screen mode must be correct, for it all to work properly. The sprite is removed from screen by normal techniques, either clearing that part of the screen or 'Exclusive-ORing' the sprite. There isn't space here to say why, but if you select GCOL 3,1 and plot some graphics, and plot the same graphics again in exactly the same place, the screen returns to the display present when you started. Listing 3 uses this. It plots a sprite, then plots it again, making it disappear. The variables are altered and the process is repeated further along the screen. The eye is tricked into thinking that it is animation, although it is, as I have said, rather flickery, and there are better animation techniques.

The sprite system has a few other useful features. The *SEDIT command allows you to take an already defined sprite to use as the basis for new sprite. If you typed *SEDIT 3,8 the picture for sprite three would appear in the editor, ready for alteration, but when you press Escape, the revised picture would become sprite eight. SDELETE will delete several sprites ie, *SDELETE 3,4,5,6 and *SRENUMBER 12,2 will copy the picture in sprite 12 into sprite two, delete sprite 12, and lose the old version of sprite two as well. A summary of sprite commands is available at any time by typing *HELP SPRITES.

One way of defining sprites is particularly suitable where you already have the picture in a program. The *SGET command (or VDU 23,27,1...) will read in an area of screen defined by the last two graphics points, and make it into a sprite.

MOVE1000,0:MOVE1279,255:*SGET 2

would copy a small rectangle in the bottom right-hand corner of the screen into sprite two, without using the editor at all.

I've really only scratched the surface of what you can do with the sprite system in this article. Once you've got the hang of designing sprites and putting them on screen, you should look up some of the articles in past issues of *Acorn User* on sprite design, and topics like 'aliases' – slightly altered versions of the sprites which are displayed consecutively to give effects such as walking. The system is quite good, and together with the very fast BBC Basic, it should be possible to write your own simple animated games.

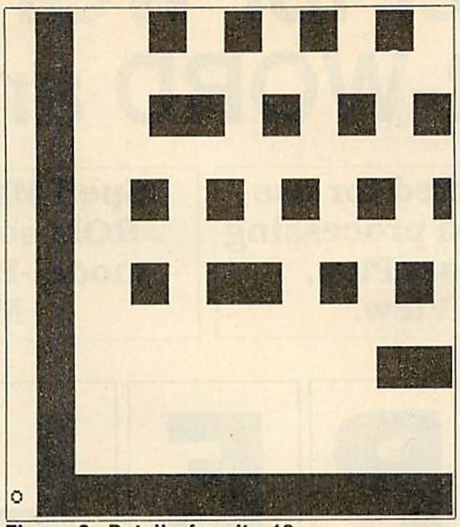


Figure 3. Detail of sprite 10

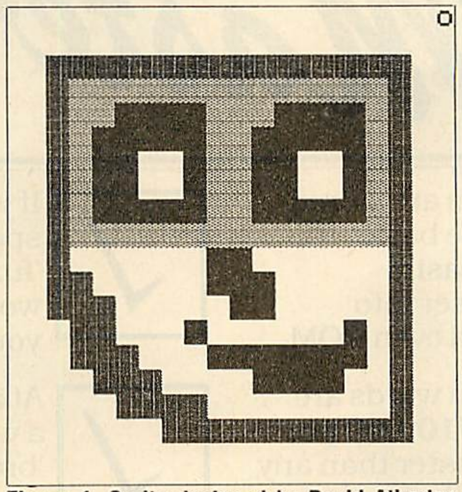


Figure 4. Sprite designed by David Atherton

Star (*) commands

SPRITE Activate sprite ROM and allow other commands
NOSPRITE Deactivate sprite ROM. Other commands do not work
SCHOOSE n Select sprite n for plotting ie, *SCHOOSE 5 VDU 23,27,0,n has an equivalent effect
SDELETE n(,m,p..) Delete sprite n (or multiple sprites) from memory
SEDIT n(,m) Define/edit sprite n (it may or may not already exist). Optionally take sprite n, edit it, and edited version becomes sprite m, ie, when generating aliases for animations. See page 105 for editor commands.
SGET n Define sprite n from screen memory. VDU 23,27,1,n; has an equivalent effect
SLOAD filename Load a file of sprites from disc
SMEARGE filename Load a file of sprites without wiping those in memory. If a number exists both in memory and in the file, the memory version is lost
SNEW Delete all sprites from memory
SRENUMBER n,m Make sprite n into sprite m. Any old sprite m is overwritten. There is now no sprite n
SSPACE n Does nothing (accepted for BBC B compatibility)

Plotting

PLOT &ED,X,Y Plots sprite X,Y – obeys GCOL first parameter
PLOT &EE,X,Y Plots sprite outline rectangle in colour 15
PLOT & EF,X,Y As &ED, but acts as always GCOL 0

JARGON BOX

GCOL A BBC Basic command which determines the colour and manner in which the next graphics plotting shall take place
POINT A BBC Basic function which will return the colour of a given pixel on the screen
Pointer The small on-screen arrow that is moved by you to select something from the screen display
Pointer ROM The program that makes the pointer appear. It is not actually a ROM chip – it is a disc file, but it is written in ROM format, so people refer to it (and the sprite software) as a ROM.
Sprite A small computer graphic picture or pattern, that can be placed anywhere on the screen, and animated.



Trackerball A ball mounted in a box (see picture above). Running your hand over the ball causes the on-screen cursor or pointer to move.

Turn to the yellow page index on page 113 for details of the sprite listings.

COMPETITION

THE BEST BET

Write a horse racing program and win one of 25 copies of *The Punter's Revenge*

Simon Dally

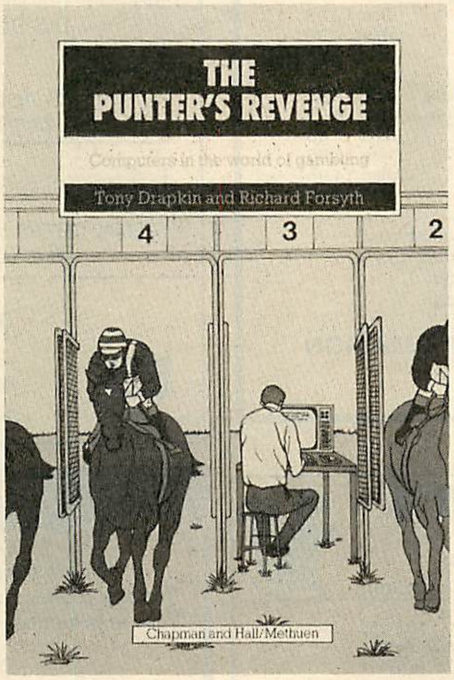
The Punter's Revenge: Computers in the World of Gambling; Tony Drapkin and Richard Forsyth; 264 pp; Chapman and Hall; £7.95

This attractively produced book is an intelligent and informative insight into the world of gambling, how the 'authorities' use computers themselves and how the informed punter can use a home computer to assist selections.

One thing the book certainly doesn't set out to do is go for the computer freak; the programs in this book are simple to follow, would work on most computers, including BBC micros, and do no more than assume a passing acquaintance with Basic.

Just over half the book is devoted to horse racing – not surprisingly since probably no other gambling activity has a wider audience in the United Kingdom – and the rest is devoted to concise but sensible discussions of probability theory, what a 'book' is, the football pools, roulette, blackjack and poker.

Like most good gambling books, this one tells you that it is completely ridiculous to imagine that when you win money by betting on horses you are 'caning the bookie', all you are doing is taking money off other punters. To illustrate this point see the table, which shows a horse race where a) the book is balanced and the bookie neither wins nor loses and b) a more likely table of odds, where anything in excess of 100 in the total is the bookie's profit. The formula to work out the difference between the odds quoted and the amount of money staked is as follows. Take the odds as written and add the two figures together, this is the bottom half of the fraction. Now make the right hand side of the odds the top of the fraction and multiply it by 100. The figure you get is the desired percentage. For example, three horses (or dogs, or whatever) are quoted at 3 to 1, 11 to 8 and 100 to 30 respectively:



Horse	SP	%
Battling Beeb	evens	50
Angry Amstrad	6-4	40
Trailing Tandy	9-1	10
	Total	100

Table A. A round book

Horse	SP	%
Battling Beeb	1-2	66.7
Angry Amstrad	3-1	25
Trailing Tandy	100-30	23.1
	Total	114.8

Table B. An overround book. Bookie's profit = 14.8%

3-1 $\rightarrow$ 1/(3+1) $\rightarrow$ 1/4 $\rightarrow$ 100/4 = 25%

11-8 $\rightarrow$ 8/(11+8) $\rightarrow$ 8/19 $\rightarrow$ 800/19 = 42.1%

100-30 $\rightarrow$ 30/(100+30) $\rightarrow$ 3000/130 = 23.08%

Through this sort of approach, and with programs which could be modified to suit your own beliefs or instincts the authors show you how you can use a computer to help you find not the dead certs (no such thing!) but vfm (value for money) bets, ie, bets where the odds on offer are higher than you should reasonably expect and therefore possibly worth a flutter.

The authors also give some detailed analysis of the football pools, pointing out that this really is a mug's game, with less than 30 per cent of the total staked being returned to the punters (avoid Zetters at all costs if this is your criterion!). However, they do indicate an interesting strategy of following a particular named newspaper columnist, Figaro of *Racing and Football Outlook*, and betting on his forecasted away wins as draws!

Roulette is covered in the book with tests on how to use the micro as a time-saving device when working out a system.

The book concludes with some fascinating remarks about blackjack (the only casino game where the odds, in theory at least, can be marginally turned to the punter's favour) and programming a computer to play poker; this latter chapter delves a little into the fascinating world of Artificial Intelligence.

Competition

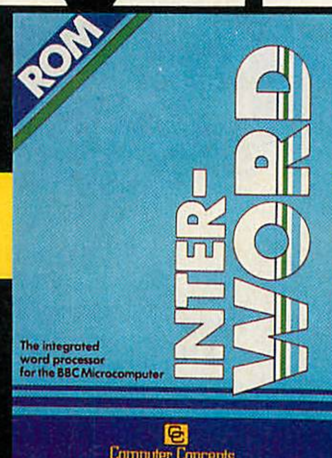
This month's competition, easier than usual, is to write a program enabling a punter to analyse a horse race as shown in Table A, by entering the name of each horse and the quoted odds, and producing an overall view of the book and the bookie's profit.

Please enclose a listing and a sample output (preferably taken from real life).

Points will be awarded for neatness and clarity, and the 25 most elegant entries in the editor's opinion will each receive a copy of the book.

Entries to April Competition, Acorn User, 141-143 Drury Lane, London WC2B, 5TF to arrive by April 16, 1987.

INTER-WORD



The integrated word processor for the BBC micro

INTER-WORD is fast, efficient and simple to use. Being menu operated the newcomer does not need to remember strange key combinations or command names. The menus are not a burden to the experienced user since there are shortcuts to access many of the features.

Some of its special features are:

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Underline, bold and a special dotted style are shown on screen exactly as they would appear on the final printout. Also left, centred and right justified text is shown on screen as you edit. What you see on screen is really what you get on the printout.

• Multiple documents in memory
Most people do not work on one document at a time. INTER-WORD allows up to 16 documents to be stored in memory at once, and text to be transferred from one to another.

• Multi column
Built in facilities for printing text in up to 5 columns.

• Pull down menu operation
Simple and fast selection of all INTER-WORD options and page layout.

• Multi-file operation
Very large documents can be handled with ease. INTER-WORD's unique multi-file mode puts virtually no limits on document size and allows simple and fast movement to any point in the document.

• Specific page printing
Any page or range of pages may be printed, even in multi-file mode, with any number of copies.

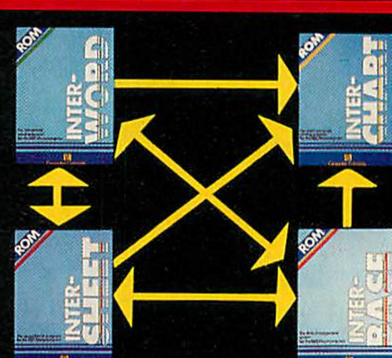
20% discount

Available to all WORDWISE PLUS owners. Simply quote your serial number, name and address when ordering direct. Discount price; £39.20 + VAT (£45.08 incl.)

Review

"INTER-WORD is the most powerful and comprehensive word processor available for the BBC today. It is more powerful and flexible than View and still retains much of the friendliness and ease of use of Wordwise. Inter-Word looks set to become the standard word processor for the BBC Micro."

Beebug, Aug/Sept '86



Inter-Word is part of the 'ROM Link' series which is the only truly integrated suite of ROMs for the BBC micro.

£49.00+vat (£56.35)

Computer Concepts

Gaddesden Place, Hemel Hempstead, Herts HP2 6EX, England. Telephone (0442) 63933

• Block operations
These are common to most word processors, but with INTER-WORD any part of the text can be marked and then instantly moved, copied, deleted, printed, saved, underlined etc. There is no limit to the amount that can be marked.

• Automatic re-formatting
This enables the user to just type—no keys to press to re-format the paragraph after changes to the text or margins have been made; the margins on the rulers can simply be dragged, all text being instantly re-formatted to the new settings.

- **40, 53, 80 and 106 column screen modes**
- **Mail merge**
- **Integrates with all other parts of INTER family**
- **Automatic page numbering, with headers and footers**
- **Very fast and smooth scrolling**
- **Powerful search and replace facilities including wildcards, upper/lower case sensitivity, stored search and replace strings for instant re-use**
- **Automatic word count**
- **Fast simple cursor movement to any point**
- **Easily tailored to any printer**
- **Line numbering**
- **Selectable screen colours**
- **Compatible with the B, B+ and Master; Solidisk, Aries and Watford shadow RAM boards.**

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Compatible with all BBC Micros

YELLOW PAGES

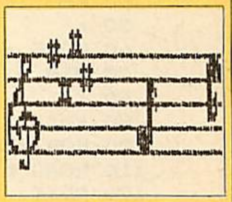
INDEX / COMPATIBILITY

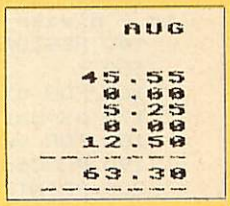
Entering listings

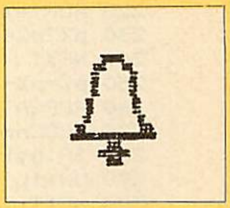
To make the task of entering listings easier, *Acorn User* has adopted several standards in the Yellow Pages. Programs are listed with line numbers in increments of 10, so type AUTO <Return> for automatic line numbering before you start. Before you list what you've entered, type LISTO 1 <Return> to provide spaces after the line numbers. Programs in the Yellow Pages are often listed to a width of 40 characters, so type MODE 6 <Return> before you start. Comparing the line-endings of your listing with the Yellow Pages will help you spot extra or missing characters.

To make sure that the program you want to enter will work on your particular machine, check the index below. All the listings work with Basic 1,2 and 4 (unless stated otherwise) and with operating system OS1.2 or above. If a program is accompanied by an article, please read the article first. If special care is needed when entering, we provide a 'How to Enter' box.

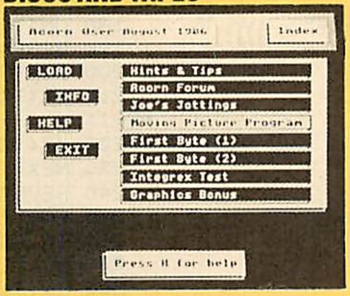
Once you've typed in your program, save it to tape or disc then test it by running it. If you have a major problem with a listing, ask someone to check it. You can also send off for a list of *Checksums* which help you find the errors. Send a large SAE (26p stamp) to *AU* Checksums, PO Box 641, London NW9 8TF.







DISCS AND TAPES



All the listings on these pages can be found on this month's listings disc or cassette. See page 109 for details.

BACK ISSUES





For help with entering and debugging listings see the following back issues: April '86, June '85, Aug '84, Sept '83.

Program	Page	BBCB	BBCB+/128k	BBC with ADFS	Shadow RAM	Electron	Electron with Plus 1	Electron with Plus 1 & Plus 3	Master 128	Master 128+ ADFS	Master Compact	6502SP	Econet	Monthly tape & disc
David Acton														
Listings 1-5	114	✓	✓	✓	✓	×	×	×	✓	✓	✓	×	✓	✓
Dave Lawrence														
Listings 1-2	117	✓	✓	✓	✓	×	×	×	✓	✓	✓	×	✓	✓
Cornford Wood														
Listings 1-2	122	✓[1]	✓[1]	✓[1]	✓[1]	×	×	×	✓[1]	✓[1]	×	×	✓[1]	✓
Knight														
Listing 1	124	✓	✓	✓	✓	×	×	×	✓	✓	✓	✓	✓	✓
David Atherton														
Listing 1-3	125	✓[2]	✓[2]	✓[2]	✓[2]	×	×	×	×	×	✓	×	✓	✓
First Byte														
Listings 1-2	126	×	✓	×	×	×	×	×	✓	✓	✓	×	✓	✓
Hints & Tips														
Listing 1-4	127	✓	✓	✓	✓	✓	✓[3]	✓[3]	✓	✓	✓	✓	✓	✓

1 Requires Music 500
2 Listing 3 works with GXR ROM
3 Listing 1 and 2 only with Electron

Micro Music, page 81

Listing 1. Sample *Autumn* file creator

```
   10 REM Sample AUTUMN file creator
   20 REM by Dave Acton
   30 REM for BBC B/B+/M/C
   40 REM (c) Acorn User April 1987
   50 :
   60 MODE 6
   70 DIM data% 1000,env%(13),save% 20
   80 :
   90 total%=0
  100 FOR e%=1 TO 291
  110 READ byte%:total%=total%+byte%
  120 NEXT
  130 IF total%<>17386 PRINT"Checksum err
or - please check DATA":END
  140 RESTORE
  150 :
  160 FOR e%=1 TO 13:READ env%(e%):NEXT
  170 p%=data%+6
  180 FOR voice%=0 TO 1
  190 PROCpoint(voice%)
  200 PRINT"Compiling voice ";voice%+1
  210 ?p%=254
  220 FOR e%=1 TO 13
  230 p%?e%=env%(e%)
  240 NEXT
  250 p%=p%+14
  260 REPEAT
  270 PROCnext
  280 IF byte%<255 PROCnext
  290 UNTIL byte%=255
  300 NEXT voice%
  310 p%=p%-1
  320 PROCpoint(2)
  330 $save%="SAVE SAMPLE "+STR$~data%+"
"+STR$~(p%+1)
  340 X%=save%:Y%=save% DIV 256
  350 PRINT"Saving 'SAMPLE'"
  360 CALL &FFF7
  370 END
  380 :
  390 DEF PROCpoint(k%)
  400 pointer%=p%-data%:loc%=data%+2*k%
  410 ?loc%=pointer%
  420 loc%?1=pointer% DIV 256
  430 ENDPROC
  440 :
  450 DEF PROCnext
  460 READ byte%:?p%=byte%:p%=p%+1
  470 ENDPROC
  480 :
  490 DATA 1,0,0,0,1,1,1,80,0,0,253,80,80
  500 :
  510 DATA 17,8,0,8,0,2,65,2,109,2
  520 DATA 101,2,93,2,85,2,81,2,73,2
  530 DATA 65,4,93,4,61,4,93,4,65,4
  540 DATA 45,4,33,4,45,4,17,4,65,4
  550 DATA 53,4,65,4,25,8,0,8,0,4,73,4
  560 DATA 61,4,73,4,33,8,0,8,0,4,65,4
  570 DATA 81,4,93,4,53,4,93,4,89,4
  580 DATA 101,4,61,4,93,2,85,2,93,4
  590 DATA 73,4,45,4,73,4,93,12,255
  600 :
  610 DATA 141,2,161,2,157,2,149,2
  620 DATA 141,2,133,2,129,2,121,2
  630 DATA 113,1,121,1,113,1,121,1
  640 DATA 113,4,0,4,121,4,129,2,113,2
  650 DATA 109,2,113,2,141,2,121,2
  660 DATA 113,2,121,2,129,2,133,2
  670 DATA 129,2,121,2,113,2,129,2
  680 DATA 121,2,133,2,129,2,149,2
  690 DATA 145,2,149,2,161,2,157,2
  700 DATA 149,2,141,2,137,2,141,2
  710 DATA 137,2,129,2,121,2,137,2
```

Continued ▶

◀ *Autumn* listing 1 continued

```
  720 DATA 129,2,141,2,137,2,157,2
  730 DATA 149,2,157,2,169,2,161,2
  740 DATA 157,2,149,2,141,2,149,2
  750 DATA 141,2,137,2,129,2,141,2
  760 DATA 149,2,157,2,161,2,177,2
  770 DATA 169,2,177,2,189,2,181,2
  780 DATA 177,2,169,2,161,2,177,2
  790 DATA 169,2,177,2,197,2,189,2
  800 DATA 185,2,177,2,169,2,161,2
  810 DATA 157,2,149,2,157,2,141,2
  820 DATA 149,2,137,2,141,1,149,1
  830 DATA 141,1,149,1,141,16,255
```

Listing 2. *Autumn* file player (Basic)

```
   10 REM AUTUMN file player (Basic)
   20 REM by Dave Lawrence/Dave Acton
   30 REM for BBC B/B+/M/C
   40 REM (c) Acorn User April 1987
   50 :
   60 MODE 7
   70 HIMEM=&6000:S%=&6000
   80 DIM p%(3),d%(3),env% 14
   90 :
  100 INPUT"AUTUMN file name  : "name$
  110 OSCLI("*LOAD "+name$+" 6000")
  120 REPEAT
  130 INPUT"Tempo (1=fastest) : "tempo%
  140 UNTIL tempo%>0
  150 REPEAT
  160 INPUT"Repeat tune? Y/N  : "rep$
  170 rep$=CHR$(ASC(rep$) AND &DF)
  180 UNTIL rep$="Y" OR rep$="N"
  190 REPEAT
  200 FOR I%=0 TO 2
  210 p%(I%+1)=S%+?(S%+I%*2)+256*?(S%+I%
*2+1)
  220 d%(I%+1)=FALSE
  230 NEXT
  240 REPEAT
  250 FOR I%=1 TO 3
  260 IF ADVAL(-5-I%)>0 PROCsound
  270 NEXT
  280 UNTIL d%(1) AND d%(2) AND d%(3)
  290 UNTIL rep$="N"
  300 END
  310 :
  320 DEF PROCsound
  330 IF d%(I%) ENDPROC
  340 p%=?p%(I%):d%=?(p%(I%)+1)
  350 IF p%=254 PROCenv:ENDPROC
  360 IF p%=255 d%(I%)=TRUE:ENDPROC
  370 IF p%=0 V%=0 ELSE V%=I%
  380 SOUND I%,V%,p%,d%*tempo%
  390 p%(I%)=p%(I%)+2
  400 ENDPROC
  410 :
  420 DEF PROCenv
  430 IF ADVAL(-5-I%)<>15 ENDPROC
  440 ?env%=I%
  450 FOR J%=1 TO 13
  460 J%?env%=?(p%(I%)+J%)
  470 NEXT
  480 X%=env%:Y%=env% DIV 256
  490 A%=8:CALL &FFF1
  500 p%(I%)=p%(I%)+14
  510 ENDPROC
```

Listing 3. *Autumn* file player (Play)

```
   10 REM AUTUMN file player (*PLAY)
   20 REM by Dave Acton
   30 REM for BBC B/B+/M/C
```

Continued ▶

◀ *Autumn* listing 3 continued

```
40 REM (c) Acorn User April 1987
50 :
60 MODE 7
70 DIM save% 40
80 command=&F2:name=&70:addr=&72
90 read=&74:fin=&76:free=&79
100 start=&86:point=&88:voice=&8E
110 tempo=&8F:string=&AE0
120 osfile=&FFDD:osbyte=&FFF4
130 osword=&FFF1:oscli=&FFF7
140 FOR pass%=0 TO 2 STEP 2
150 P%=&900
160 [OPT pass%
170 .play
180 LDY #4
190 JSR skipspace
200 TYA
210 CLC
220 ADC command
230 STA command
240 LDA command+1
250 ADC #0
260 STA command+1
270 LDY #0
280 .copyloop
290 LDA (command),Y
300 STA string,Y
310 INY
320 CMP #32
330 BNE copyloop
340 LDA #13
350 STA string,Y
360 LDA #0
370 LDX #15
380 .clear
390 STA addr,X
400 DEX
410 BPL clear
420 JSR skipspace
430 .decode
440 LDA (command),Y
450 CMP #32
460 BEQ done
470 CMP #ASC"0"
480 BCC syntax
490 CMP #ASC"9"+1
500 BCC number
510 CMP #ASC"F"+1
520 BCS syntax
530 CMP #ASC"A"
540 BCC syntax
550 SBC #55
560 JMP add
570 .number
580 EOR #48
590 .add
600 LDX #4
610 .shift
620 ASL addr
630 ROL addr+1
640 DEX
650 BNE shift
660 CLC
670 ADC addr
680 STA addr
690 INY
700 BCC decode
710 INC addr+1
720 JMP decode
730 .syntax
740 BRK:BRK
750 ]:$P%="Syntax: *PLAY <name> <addr>
<tempo>":P%=P%+LEN$P%
760 [OPT pass%:BRK
```

Continued ▶

◀ *Autumn* listing 3 continued

```
770 :
780 .done
790 LDA addr
800 STA start
810 LDA addr+1
820 STA start+1
830 JSR skipspace
840 CMP #ASC"9"+1
850 BCS syntax
860 CMP #ASC"1"
870 BCC syntax
880 SBC #48
890 STA tempo
900 LDA #string MOD 256
910 STA name
920 LDA #string DIV 256
930 STA name+1
940 LDX #name MOD 256
950 LDY #name DIV 256
960 LDA #&FF
970 JSR osfile
980 JSR initpoint
990 .repeat
1000 LDA #3
1010 STA voice
1020 .voiceloop
1030 JSR dovoice
1040 DEC voice
1050 BNE voiceloop
1060 BIT &FF
1070 BMI escape
1080 LDA fin
1090 AND fin+1
1100 AND fin+2
1110 BEQ repeat
1120 RTS
1130 :
1140 .escape
1150 BRK
1160 ]:?P%=17:P%=P%+1
1170 $P%="Escape":P%=P%+LEN$P%
1180 [OPT pass%:BRK
1190 :
1200 .initpoint
1210 LDY #5
1220 .copypoint
1230 LDA (start),Y
1240 STA point,Y
1250 DEY
1260 BPL copypoint
1270 LDX #2
1280 LDA #0
1290 .finloop
1300 STA fin,X
1310 DEX
1320 BPL finloop
1330 RTS
1340 :
1350 .dovoice
1360 LDX voice
1370 LDA fin-1,X
1380 BNE nosound
1390 LDA #251
1400 SEC
1410 SBC voice
1420 TAX
1430 LDY #&FF
1440 LDA #128
1450 JSR osbyte
1460 STX free
1470 CPX #0
1480 BEQ nosound
1490 LDA voice
```

Continued ▶

◀ *Autumn* listing 3 continued

```
1500 ASL A
1510 TAY
1520 LDA point-2,Y
1530 CLC
1540 ADC start
1550 STA read
1560 LDA point-1,Y
1570 ADC start+1
1580 STA read+1
1590 LDY #0
1600 LDA (read),Y
1610 CMP #&FE
1620 BNE notenv
1630 JSR env
1640 JSR next
1650 JMP dovoice
1660 .notenv
1670 CMP #&FF
1680 BNE notfin
1690 LDX voice
1700 STA fin-1,X
1710 JMP nosound
1720 .notfin
1730 JSR sound
1740 .next
1750 LDA voice
1760 ASL A
1770 TAY
1780 LDA read
1790 SEC
1800 SBC start
1810 STA point-2,Y
1820 LDA read+1
1830 SBC start+1
1840 STA point-1,Y
1850 .nosound
1860 RTS
1870 :
1880 .sound
1890 STA pitch
1900 JSR incread
1910 LDA #0
1920 LDX tempo
1930 .howlong
1940 ADC (read),Y
1950 DEX
1960 BNE howlong
1970 STA dur
1980 JSR incread
1990 LDA voice
2000 STA note
2010 STA volume
2020 LDA pitch
2030 BNE notrest
2040 STA volume
2050 .notrest
2060 LDX #note MOD 256
2070 LDY #note DIV 256
2080 LDA #7
2090 JMP osword
2100 :
2110 .env
2120 LDA free
2130 CMP #15
2140 BEQ empty
2150 RTS
2160 .empty
2170 LDA voice
2180 STA pars
2190 LDX #1
2200 .envloop
2210 JSR incread
2220 LDA (read),Y
2230 STA pars,X
```

Continued ▶

◀ *Autumn* listing 3 continued

```
2240 INX
2250 CPX #14
2260 BNE envloop
2270 LDX #pars MOD 256
2280 LDY #pars DIV 256
2290 LDA #8
2300 JSR osword
2310 :
2320 .incread
2330 INC read
2340 BNE nothigh
2350 INC read+1
2360 .nothigh
2370 RTS
2380 :
2390 .notspace
2400 INY
2410 .findspace
2420 LDA (command),Y
2430 CMP #32
2440 BNE notspace
2450 RTS
2460 :
2470 .space
2480 INY
2490 .skipspace
2500 LDA (command),Y
2510 CMP #32
2520 BEQ space
2530 RTS
2540 :
2550 .note   BRK:BRK
2560 .volume BRK:BRK
2570 .pitch  BRK:BRK
2580 .dur    BRK:BRK
2590 .pars
2600 ]:NEXT pass%
2610 $save%="SAVE PLAY 900 "+STR$~P%+"
 "+STR$~play
2620 X%=save%:Y%=save% DIV 256
2630 PRINT"Saving *PLAY"
2640 CALL oscli
2650 total%=0
2660 FOR check%=&900 TO P%-1
2670 total%=total%+?check%
2680 NEXT check%
2690 IF total%<>52235 PRINT"Checksum er
ror - please check listing"
2700 END
```

Listing 4. To play music is the background

```
180 LDY #5
750 ]:$P%="Syntax: *EVENT <name> <addr>
<tempo>":P%=P%+LEN$P%
971 SEI
972 LDA #event MOD 256:STA &220
973 LDA #event DIV 256:STA &221
974 CLI
975 LDA #14:LDX #0:JSR osbyte
976 LDA #230:LDX #255:LDY #0:JSR osbyte
1110 BNE initpoint
2541 .event
2542 PHA:TXA:PHA:TYA:PHA
2543 JSR repeat
2544 PLA:TAY:PLA:TAX:PLA
2545 RTS
2610 $save%="SAVE EVENT 900 "+STR$~P%+"
"+STR$~play
2630 PRINT"Saving *EVENT"
2690 IF total%<>57347 PRINT"Checksum err
or - please check listing"
```

Listing 5. Event demonstration

```
 10 REM *EVENT Demonstration
 20 REM by Dave Acton
 30 REM for BBC B/B+/M/C
 40 REM (c) Acorn User April 1987
 50 :
 60 MODE 0:HIMEM=&2000
 70 *EVENT SAMPLE 2000 1
 80 PROCsquare(640,512,512)
 90 END
100 :
110 DEF PROCsquare(x%,y%,d%)
120 IF d%<16 ENDPROC
130 LOCAL x1%,y1%,x2%,y2%
140 x1%=x%-d%/2:x2%=x%+d%/2
150 y1%=y%-d%/2:y2%=y%+d%/2
160 MOVE x1%,y1%
170 DRAW x2%,y1%:DRAW x2%,y2%
180 DRAW x1%,y2%:DRAW x1%,y1%
190 PROCsquare(x1%,y1%,d%/2)
200 PROCsquare(x2%,y1%,d%/2)
210 PROCsquare(x2%,y2%,d%/2)
220 PROCsquare(x1%,y2%,d%/2)
230 ENDPROC
```

See Variations on a Theme, page 86

Listing 1. Loader for Music Editor (*Theme*)

```
 10 REM Loader for Music Editor
 20 REM by David Lawrence
 30 REM for BBC B/B+/M/C
 40 REM (c) Acorn User April 1987
 50 :
 60 MODE 7
 70 PROCcode
 80 PROCchecksum
 90 PROCvdus
100 PROCenvs
110 CHAIN "MUSIC2"
120 :
130 DEF PROCcode
140 addr=&70
150 FOR pass%=0 TO 2 STEP 2
160 P%=&9C0
170 [OPT pass%
180 .findend
190 STA addr+1
200 LDY #0
210 STY addr
220 .loop
230 DEY
240 DEY
250 CPY #&FE
260 BNE notlo
270 DEC addr+1
280 .notlo
290 LDA (addr),Y
300 BNE got
310 INY
320 LDA (addr),Y
330 BNE got2
340 DEY
350 JMP loop
360 .got2
370 DEY
380 .got
390 STY addr
400 RTS
410 ]
420 NEXT pass%
430 ENDPROC
440 :
450 DEF PROCchecksum
460 T%=0
```

Continued ▶

◀ *Theme* listing 1 continued

```
 470 FOR I%=&9C0 TO P%-1
 480 T%=T%+?I%
 490 NEXT
 500 IF T%<>3992 PROCerror("code")
 510 T%=0
 520 FOR I%=1 TO 256
 530 READ V%
 540 T%=T%+V%
 550 NEXT
 560 IF T%<>13632 PROCerror("vdus")
 570 T%=0
 580 FOR I%=1 TO 208
 590 READ V%
 600 T%=T%+V%
 610 NEXT
 620 IF T%<>2581 PROCerror("envs")
 630 RESTORE
 640 ENDPROC
 650 :
 660 DEF PROCerror(a$)
 670 VDU 7
 680 PRINT "Checksum error in ";a$;"."
 690 END
 700 :
 710 DEF PROCvdus
 720 FOR I%=128 TO 159
 730 VDU 23,I%
 740 FOR J%=1 TO 8
 750 READ V%
 760 VDU V%
 770 NEXT
 780 NEXT
 790 ENDPROC
 800 :
 810 DEF PROCenvs
 820 M%=&A00
 830 FOR E%=0 TO 15
 840 ?(M%+E%*16)=E%+1
 850 FOR I%=1 TO 13
 860 READ V%
 870 ?(M%+E%*16+I%)=V%
 880 NEXT
 890 X%=E%*16 : Y%=&A : A%=8 : CALL&FFF
1
 900 NEXT
 910 ENDPROC
 920 :
 930 REM VDU data
 940 :
 950 DATA 0,0,60,102,66,102,60,0
 960 DATA 12,12,124,204,204,204,120,0
 970 DATA 12,12,124,252,252,252,120,0
 980 DATA 14,15,125,252,252,252,120,0
 990 DATA 0,12,12,12,12,12,12,12
1000 DATA 0,14,15,13,12,12,12,12
1010 DATA 0,14,15,13,14,15,13,12
1020 DATA 0,0,40,124,40,40,124,40
1030 DATA 32,32,44,50,34,44,48,0
1040 DATA 0,16,16,28,20,28,4,4
1050 DATA 0,0,0,0,0,192,192,0
1060 DATA 1,3,2,2,3,3,6,14
1070 DATA 128,192,64,192,128,0,0,0
1080 DATA 26,26,49,97,99,199,201,216
1090 DATA 0,0,0,0,192,240,24,152
1100 DATA 204,68,96,56,15,0,6,7
1110 DATA 152,152,176,224,128,128,128,1
28
1120 DATA 127,128,128,220,124,8,0,0
1130 DATA 192,102,38,16,16,16,22,22
1140 DATA 0,0,0,0,0,0,1,2
1150 DATA 16,16,32,32,64,128,0,0
1160 DATA 0,49,31,2,4,4,8,8
1170 DATA 8,4,6,6,6,12,24,16
```

Continued ▶

◄ *Theme* **listing 1 continued**

```
1180 DATA 8,4,14,17,32,32,16,8
1190 DATA 0,0,0,126,126,255,0,0
1200 DATA 255,126,126,0,0,0,0,0
1210 DATA 0,30,51,51,51,62,48,48
1220 DATA 0,30,63,63,63,62,48,48
1230 DATA 0,30,63,63,62,52,60,56
1240 DATA 48,48,48,48,48,48,48,0
1250 DATA 48,48,48,48,52,60,56,0
1260 DATA 52,60,56,52,60,56,0,0
1270 :
1280 REM Envelope data
1290 :
1300 DATA 1,0,0,0,0,0,0,127,-1,-1,-1,12
0,80
1310 DATA 1,0,0,0,0,0,0,90,-1,-1,-1,90,
50
1320 DATA 1,0,0,0,0,0,0,40,-1,-1,-1,40,
5
1330 DATA 1,0,0,0,0,0,0,127,0,0,-127,12
7,0
1340 DATA 1,0,0,0,0,0,0,90,0,0,-90,90,0
1350 DATA 1,0,0,0,0,0,0,40,0,0,-20,40,0
1360 DATA 1,0,0,0,1,1,1,126,0,0,-3,126,
126
1370 DATA 1,0,0,0,1,1,1,80,0,0,-3,80,80
1380 DATA 5,1,-1,0,1,1,1,126,0,0,-16,12
6,126
1390 DATA 3,1,-1,0,1,1,1,126,0,0,-16,12
6,126
1400 DATA 1,0,0,0,1,1,1,126,-8,-3,-3,12
6,60
1410 :
1420 REM Put your own envelopes here
1430 :
1440 DATA 1,0,0,0,0,0,0,0,0,0,0,0,0,0
1450 DATA 1,0,0,0,0,0,0,0,0,0,0,0,0,0
1460 DATA 1,0,0,0,0,0,0,0,0,0,0,0,0,0
1470 DATA 1,0,0,0,0,0,0,0,0,0,0,0,0,0
1480 DATA 1,0,0,0,0,0,0,0,0,0,0,0,0,0
```

Listing 2. The Music Editor

```
10 REM The Music Editor
20 REM by David Lawrence
30 REM for BBC B/B+/M/C
40 REM (c) Acorn User April 1987
50 :
60 ON ERROR GOTO 180
70 *TV 0 1
80 MODE 4 : HIMEM=&4C00
90 PROCcheck
100 PROCinit
110 PROCwindows
120 PROCscrn
130 PROCedit
140 MODE 4
150 PROCstars
160 END
170 :
180 PROCstars
190 VDU 3
200 PROCflash(1)
210 REPORT : PRINT " at line ";ERL
220 END
230 :
240 DEF PROCcheck
250 PROCflash(0)
260 T%=0
270 FOR I%=1 TO 97
280 READ V%
290 T%=T%+V%
300 NEXT
```

Continued ►

◄ *Theme* **listing 2 continued**

```
310 IF T%=9899 RESTORE : ENDPROC
320 PRINT "Error in data." : VDU7
330 PROCstars
340 END
350 :
360 DEF PROCstars
370 *FX 4
380 *FX 12 3
390 *FX 225 1
400 *FX 200 0
410 ENDPROC
420 :
430 DEF PROCinit
440 DIM c%(3),ch$(5),P%(29),p%(3)
450 DIM d%(3),a%(29),ac%(3,2),m%(3)
460 DIM up$(5),n%(2),E%(3)
470 c1%=&4C00:c2%=&5000:c3%=&5400
480 c%(1)=c1%:c%(2)=c2%:c%(3)=c3%
490 notes%=512:mem%=2*notes%
500 pgs%=notes%/8-1:S%=2:N%=1:ss%=-1
510 nn%=-1:P%=0:pp%=-1:ln2=LN2
520 nkey$="":rkey$="":T%=1:end%=FALSE
530 *FX 4 1
540 *FX 12 3
550 *FX 225 140
560 *FX 226 150
570 *FX 200 1
580 FOR I%=0 TO mem%-4 STEP 4
590 I%!c1%=0:I%!c2%=0:I%!c3%=0
600 NEXT
610 FOR I%=1 TO 3:?(c%(I%))=15:?(c%(I%
)+1)=8
620 n%(I%-1)=1:E%(I%)=1:NEXT
630 FOR I%=0 TO 5:READ ch1%,ch2%
640 ch$(I%)=CHR$ch1%+CHR$8+CHR$10+CHR$
ch2%
650 NEXT
660 FOR I%=0 TO 5:READ ch1%,ch2%
670 up$(I%)=CHR$ch1%+CHR$8+CHR$10+CHR$
ch2%+CHR$11
680 NEXT
690 FOR I%=0 TO 3:FOR J%=0 TO 2
700 READ ac%(I%,J%):NEXT:NEXT
710 FOR I%=0 TO 5
720 nkey$=nkey$+CHR$(140+I%)
730 rkey$=rkey$+CHR$(150+I%)
740 NEXT
750 PROCflash(0)
760 PRINTTAB(12);FNdouble("The Music E
ditor")
770 PRINTTAB(12,2);STRING$(16,"~")
780 PRINT'FNdouble("Please enter the k
ey signature (eg: 1S,2F,<ret>) :");CHR$1
0;
790 PROCflash(1)
800 REPEAT n$=GET$
810 UNTILn$=CHR$13OR(n$>"0"ANDn$<"6")
820 key$=FNgetkey
830 nk%=VAL(n$):PROCflash(0):CLS
840 ENDPROC
850 :
860 DEF FNgetkey
870 IF n$=CHR$13 THEN ="N"
880 PRINT CHR$11;FNdouble(n$);CHR$10;
890 REPEAT key$=GET$
900 UNTIL key$="S"ORkey$="F"
910 PRINT CHR$11;FNdouble(key$)
920 =key$
930 :
940 DEF FNdouble(s$)
950 ?&80=128:X%=&80:Y%=0:A%=&A
960 CALL &FFF1
970 FOR i%=1 TO LEN(s$)
```

Continued ►

◀ *Theme* listing 2 continued

```
 980 ?&70=ASC(MID$(s$,i%,1))
 990 X%=&70:CALL &FFF1
 1000 IF POS=39 PRINT'
 1010 VDU 23,128,?&71,!&71;!&72;!&73;?&7
4,128,10,8
 1020 VDU 23,128,?&75,!&75;!&76;!&77;?&7
8,128,11
 1030 NEXT
 1040 VDU 23,128,!&81;!&83;!&85;!&87;
 1050 =CHR$0
 1060 :
 1070 DEF PROCflash(s%)
 1080 VDU 23,0,10,255-159*s%;0;0;0;
 1090 ENDPROC
 1100 :
 1110 DEF PROCwindows
 1120 VDU 28,32,12,39,0,11
 1130 PRINTFNdouble("The")''FNdouble("Mu
sic")''FNdouble("Editor")''
 1140 PRINT"By DavidLawrence"'"(c)AU 87"
 1150 COLOUR 129:COLOUR 0:GCOL 0,0
 1160 VDU 28,0,0,30,0,12
 1170 VDU 28,32,12,39,12,12
 1180 VDU 28,32,31,39,14,12,26
 1190 PRINTTAB(32,12);"Tempo: 1"
 1200 ENDPROC
 1210 :
 1220 DEF PROCscrn
 1230 RESTORE 5520
 1240 FOR I%=1 TO 29:READ P%(I%):NEXT
 1250 VDU 28,0,31,30,2,12,26
 1260 PRINTTAB(0,0);"Page: 0    V1:     V2
:  V3:   "
 1270 VDU 5
 1280 FOR st%=0 TO 2:FOR I%=2 TO 12
 1290 IF I%<>7 MOVE 0,st%*320+I%*20+10:P
LOT 1,160,0
 1300 NEXT
 1310 MOVE 4,st%*320+250:VDU 139,140
 1320 MOVE 4,st%*320+218:VDU 141,142
 1330 MOVE 4,st%*320+186:VDU 143,144
 1340 MOVE 4,st%*320+126:VDU 145,146
 1350 MOVE 4,st%*320+94:VDU 147,148
 1360 IF key$<>"N" PROCkeysig
 1370 NEXT
 1380 VDU 4:PROCalter(key$,nk%)
 1390 FOR st%=0 TO 2
 1400 PRINTFNnumb(st%):NEXT
 1410 ENDPROC
 1420 :
 1430 DEF PROCalter(key$,nk%)
 1440 FOR I%=1 TO 29:a%(I%)=1:NEXT
 1450 IF key$="N" ENDPROC
 1460 RESTORE 5580:a%=4
 1470 IF key$="F" RESTORE 5590:a%=-4
 1480 FOR I%=1 TO nk%:READ s%:REPEAT
 1490 P%(s%)=P%(s%)+a%:a%(s%)=a%/4+1
 1500 s%=s%+7
 1510 UNTIL s%>29:NEXT
 1520 ENDPROC
 1530 :
 1540 DEF PROCpage(p%)
 1550 FOR st%=0 TO 2
 1560 PROCstave(st%):NEXT
 1570 PRINTTAB(6,0);P%;" ";
 1580 ENDPROC
 1590 :
 1600 DEF PROCstave(st%)
 1610 R%=(2-st%)*10+2
 1620 VDU 28,5,R%+9,30,R%,12,26:GCOLO,0
 1630 FOR I%=2 TO 12
 1640 IF I%<>7 MOVE 160,st%*320+I%*20+10
:PLOT 1,832,0
 1650 NEXT
```

Continued ▶

◀ *Theme* listing 2 continued

```
 1660 FOR I%=0 TO 7
 1670 A%=c%(st%+1)+16*p%+I%*2
 1680 PROCnote(st%,I%+1,?A%,A%?1,0)
 1690 NEXT:ENDPROC
 1700 :
 1710 DEF PROCkeysig
 1720 RESTORE 5550
 1730 IF key$="F" RESTORE 5560
 1740 READ C%:X%=64
 1750 FOR I%=1 TO nk%
 1760 READ H%:MOVE X%,st%*320+H%:VDU C%
 1770 READ H%:MOVE X%,st%*320+H%:VDU C%
 1780 X%=X%+16:NEXT:ENDPROC
 1790 :
 1800 DEF FNnumb(c%)
 1810 VDU 31,13+c%*7,0,32,32,32,8,8,8
 1820 PRINT;n%(c%)
 1830 =CHR$0
 1840 :
 1850 DEF PROCcurs(st%,no%)
 1860 GCOL 3,1
 1870 PROCl(1):PROCl(3):PROCl(15)
 1880 PROCl(27):PROCl(29)
 1890 ENDPROC
 1900 :
 1910 DEF PROCl(ln%)
 1920 IF ln%>29 OR ln%<1 ENDPROC
 1930 MOVE 100*no%+72,st%*320+ln%*10
 1940 PLOT 1,78,0
 1950 ENDPROC
 1960 :
 1970 DEF PROCsl(ln%)
 1980 IF ln%>29 OR ln%<1 ENDPROC
 1990 MOVE 100*no%+90,st%*320+ln%*10
 2000 PLOT 1,48,0
 2010 ENDPROC
 2020 :
 2030 DEF PROCnote(st%,no%,pi%,du%,co%)
 2040 GCOL 0,co%:IF pi%=&FE PROCshowe(st
%,no%,du%):ENDPROC
 2050 IF pi%=0 AND du%=0 ENDPROC
 2060 W%=pi% AND 31:V%=st%*320+16+10*W%
 2070 H%=100*(no%+1):L%=LN(du%)/ln2
 2080 IF pi%=0 PROCrest(st%,no%,L%):ENDP
ROC
 2090 D%=0:IF LN(du%)/ln2<>L% D%=TRUE
 2100 Z%=(pi%/32) AND 3:VDU 5
 2110 IF W%<22 OR L%=5 MOVE H%,V%+32:PRI
NTch$(L%);:V%=2 ELSE MOVE H%,V%-8:PRINTu
p$(L%);:MOVE H%+36,V%:V%=-2
 2120 IF D% VDU 138,8
 2130 IF Z% VDU 8,8,134+Z%
 2140 VDU 4
 2150 IF W%=1 OR W%=15 OR W%=29 PROCsl(W
%)
 2160 IF W%<4 PROCsl(3)
 2170 IF W%>26 PROCsl(27)
 2180 IF co%=1 GCOLO,0:L%=(W%-1)OR1:PROC
l(L%-V%):PROCl(L%):PROCl(L%+V%):PROCl(L%
+2*V%)
 2190 ENDPROC
 2200 :
 2210 DEF PROCrest(st%,no%,L%)
 2220 VDU 5:V%=V%+192
 2230 IF L%<3 FOR Q%=0 TO 2-L%:MOVE H%+Q
%*4,V%+Q%*8+12:VDU 149:NEXT:VDU 4:PROCd:
ENDPROC
 2240 MOVE H%,V%:IF L%<>3 PLOT 0,0,20
 2250 VDU 148+L%
 2260 IF L%=3 MOVE H%,V%+32:VDU 150
 2270 VDU 4:PROCd
 2280 ENDPROC
 2290 :
 2300 DEF PROCd
```

Continued ▶

◄ *Theme* listing 2 continued

```
 2310 IF co%=1 GCOL0,0:PROCl(19):PROCl(2
1):PROCl(23)
 2320 ENDPROC
 2330 :
 2340 DEF PROCshowe(st%,no%,num%)
 2350 MOVE 100*(no%+1),st%*320+160
 2360 VDU 5:PRINTCHR$(num%+64):VDU4
 2370 IF co%=1 GCOL 0,0:PROCl(15)
 2380 ENDPROC
 2390 :
 2400 DEF PROCgetvals
 2410 ad%=c%(S%+1)+16*P%+N%*2-2
 2420 pi%=?ad%:du%=ad%?1
 2430 ENDPROC
 2440 :
 2450 DEF PROCedit
 2460 PROCgetvals
 2470 REPEAT
 2480 PROCcurs(ss%,nn%)
 2490 IF P%<>pp% PROCpage(P%) ELSE PROCn
ote(ss%,nn%,pi%,du%,0)
 2500 PROCcurs(S%,N%):PROCgetvals
 2510 PROCnote(S%,N%,pi%,du%,0)
 2520 REPEAT:*FX21,0
 2530 k$=GET$:ss%=S%:nn%=N%:pp%=P%
 2540 sh%=INKEY-1:ct%=INKEY-2
 2550 PROCdo
 2560 UNTIL S%<>ss% OR N%<>nn% OR P%<>pp
% OR end%
 2570 UNTIL end%
 2580 ENDPROC
 2590 :
 2600 DEF PROCdo
 2610 IF k$=CHR$136 PROCleft:ENDPROC
 2620 IF k$=CHR$137 PROCright:ENDPROC
 2630 IF k$=CHR$139 PROCup:ENDPROC
 2640 IF k$=CHR$138 PROCdown:ENDPROC
 2650 IF INSTR(nkey$,k$) PROCgetnote:END
PROC
 2660 IF INSTR(rkey$,k$) PROCgetrest:END
PROC
 2670 IF k$=CHR$13 PROCnextone:ENDPROC
 2680 IF INSTR("SFNO",k$) PROCaccident:E
NDPROC
 2690 IF k$=CHR$9 PROCplay:ENDPROC
 2700 IF k$="." PROCdot:ENDPROC
 2710 IF k$=CHR$127 PROCdelete:ENDPROC
 2720 IF k$="I" PROCinsert:ENDPROC
 2730 IF k$="@" PROCfile:ENDPROC
 2740 IF k$>"0" AND k$<":" PROCtempo:END
PROC
 2750 IF k$=CHR$146 PROCenvel:ENDPROC
 2760 IF k$="P" PROCdump
 2770 ENDPROC
 2780 :
 2790 DEF PROCleft
 2800 IF sh% AND P%>0 P%=P%-1
 2810 IF ct% P%=0:N%=2
 2820 N%=N%-1:IF N%=0 N%=8
 2830 ENDPROC
 2840 :
 2850 DEF PROCright
 2860 IF sh% AND P%<pgs% P%=P%+1
 2870 IF ct% P%=pgs%:N%=8
 2880 N%=N%+1:IF N%=9 N%=1
 2890 ENDPROC
 2900 :
 2910 DEF PROCup
 2920 IF sh% S%=(S%+1)MOD3:ENDPROC
 2930 IF pi%=&FE PROCnewenv(1):ENDPROC
 2940 IF (pi% AND 31)<29 AND pi%<>0 PROC
newnote(pi%+1,du%)
 2950 ENDPROC
 2960 :
 2970 DEF PROCdown
```

Continued ►

◄ *Theme* listing 2 continued

```
 2980 IF sh% S%=(S%+2)MOD3:ENDPROC
 2990 IF pi%=&FE PROCnewenv(-1):ENDPROC
 3000 IF (pi% AND 31)>1 PROCnewnote(pi%-
1,du%)
 3010 ENDPROC
 3020 :
 3030 DEF PROCnewenv(in%)
 3040 PROCcurs(S%,N%)
 3050 GCOL 0,1:PROCshowe(S%,N%,du%)
 3060 du%=du%+in%:IF du%=0 du%=16
 3070 IF du%=17 du%=1
 3080 ad%?1=du%
 3090 GCOL 0,0:PROCshowe(S%,N%,du%)
 3100 PROCcurs(S%,N%)
 3110 ENDPROC
 3120 :
 3130 DEF PROCgetnote
 3140 np%=pi%
 3150 IF pi%=0 OR pi%=&FE np%=15
 3160 PROCnewnote(np%,2^(ASC(k$)-140))
 3170 ENDPROC
 3180 :
 3190 DEF PROCgetrest
 3200 PROCnewnote(0,2^(ASC(k$)-150))
 3210 ENDPROC
 3220 :
 3230 DEF PROCnewnote(np%,nd%)
 3240 PROCnote(S%,N%,pi%,du%,1)
 3250 IF pi%=0 AND du%=0 n%(S%)=n%(S%)+1
:PRINTFNnumb(S%)
 3260 pi%=np%:du%=nd%
 3270 PROCnote(S%,N%,pi%,du%,0)
 3280 ?ad%=pi%:ad%?1=du%
 3290 ENDPROC
 3300 :
 3310 DEF PROCnextone
 3320 IF pi%=0 AND du%=0 PROCnewnote(15,
8):ENDPROC
 3330 N%=N%+1:IF N%=9 N%=1:P%=P%+1:IF P%
=pgs% VDU7:P%=P%-1:N%=8:ENDPROC
 3340 np%=pi%:nd%=du%:IF pi%=0 du%=0
 3350 PROCsound(S%+1,pi%,du%)
 3360 PROCgetvals
 3370 IF pi%<>0 OR du%<>0 pi%=np%:du%=nd
%:ENDPROC
 3380 IF P%=pp% PROCnote(S%,N%,np%,nd%,0
)
 3390 ?ad%=np%:ad%?1=nd%
 3400 n%(S%)=n%(S%)+1:PRINTFNnumb(S%)
 3410 pi%=np%:du%=nd%
 3420 ENDPROC
 3430 :
 3440 DEF PROCplay
 3450 FOR I%=1 TO 3:p%(I%)=c%(I%)
 3460 m%(I%)=FNfindend(I%-1):!m%(I%)=-1
 3470 d%(I%)=TRUE:E%(I%)=1:NEXT
 3480 REPEAT
 3490 FOR I%=1 TO 3
 3500 IF ADVAL(-5-I%)>0 AND d%(I%) PROCs
ound(I%,?p%(I%),?(p%(I%)+1))
 3510 NEXT
 3520 UNTIL d%(1)+d%(2)+d%(3)=0 OR INKEY
-99
 3530 IF INKEY-99 THEN *FX15
 3540 FOR I%=1 TO 3:!m%(I%)=0:NEXT
 3550 ENDPROC
 3560 :
 3570 DEF PROCsound(v%,p%,d%)
 3580 IF p%<>0 V%=E%(v%) ELSE V%=0:IF d%
=0 p%(v%)=p%(v%)+2:ENDPROC
 3590 IF p%=&FF d%(I%)=FALSE:ENDPROC
 3600 IF p%=&FE E%(v%)=d%:p%(v%)=p%(v%)+
2:ENDPROC
 3610 a%=(p%/32) AND 3:p%=p%AND31
```

Continued ►

◀ ***Theme* listing 2 continued**

```
3620 p%=P%(p%)+ac%(a%,a%(p%))
3630 SOUND v%,V%,p%,d%*T%
3640 p%(v%)=p%(v%)+2
3650 ENDPROC
3660 :
3670 DEF FNfindend(s%)
3680 A%=&50+s%*4:CALL &9C0
3690 =?&70+256*?&71+2
3700 :
3710 DEF PROCaccident
3720 IF du%=0 OR pi%=0 OR pi%=&FE ENDPR
OC
3730 np%=(pi% AND 31)
3740 IF k$="S" np%=np%+32
3750 IF k$="F" np%=np%+64
3760 IF k$="N" np%=np%+96
3770 PROCnewnote(np%,du%)
3780 ENDPROC
3790 :
3800 DEF PROCdot
3810 IF du%=0 OR pi%=&FE ENDPROC
3820 d=LN(du%)/ln2
3830 IF d=INT(d) nd%=du%*1.5 ELSE nd%=d
u%/1.5
3840 PROCnewnote(pi%,nd%)
3850 ENDPROC
3860 :
3870 DEF PROCdelete
3880 IF P%=0 AND N%=1 ENDPROC
3890 FOR I%=ad% TO FNfindend(S%) STEP 2
:!I%=I%!2:NEXT
3900 IF pi%<>0 OR du%<>0 n%(S%)=n%(S%)-
1:PRINTFNnumb(S%)
3910 PROCsortout
3920 ENDPROC
3930 :
3940 DEF PROCinsert
3950 IF P%=0 AND N%=1 ENDPROC
3960 IF P%=pgs% AND N%=8 ENDPROC
3970 FOR I%=FNfindend(S%)-2 TO ad% STEP
-2:!I%=I%!-2:NEXT
3980 ?ad%=0:ad%?1=0:PROCsortout
3990 ENDPROC
4000 :
4010 DEF PROCsortout
4020 p%=P%:PROCstave(S%)
4030 PROCcurs(S%,N%):PROCgetvals
4040 ENDPROC
4050 :
4060 DEF PROCfile
4070 VDU28,32,31,39,14
4080 PRINT" ";FNdouble("Filing")'''
4090 PRINT'"Please"'"select"'"option:"
4100 PRINT'"1) Save"'"2) Load"'"3) Fina
l4) Exit"'"5) Quit"
4110 PRINT'" ";FNdouble("Which?");CHR$1
0;
4120 PROCflash(1):*FX21,0
4130 REPEAT:k$=GET$
4140 UNTIL k$>"0" AND k$<"6"
4150 IF k$="1" PROCsave
4160 IF k$="2" PROCload
4170 IF k$="3" PROCfinal
4180 IF k$="4" VDU 12,26:PROCflash(0)
4190 IF k$="5" end%=TRUE
4200 ENDPROC
4210 :
4220 DEF PROCsave
4230 name$=FNname
4240 CLS:PRINTFNdouble("Writing.")
4250 ch%=OPENOUT(name$)
4260 PRINT#ch%,key$,nk%
4270 FOR I%=0 TO 2
4280 PRINT#ch%,n%(I%):NEXT
4290 FOR I%=c1% TO &5800
```

Continued ▶

◀ ***Theme* listing 2 continued**

```
4300 BPUT#ch%,?I%
4310 NEXT:CLOSE#0
4320 VDU 12,26:ENDPROC
4330 :
4340 DEF FNname
4350 REPEAT:CLS
4360 PRINT"Enter a"'"filename"'">";
4370 INPUT""name$
4380 ch%=OPENIN(name$)
4390 l%=EXT#ch%:CLOSE#0:yn$="Y"
4400 IF l%>0 PRINT'"Replace ?";:REPEATy
n$=GET$:UNTILyn$="Y"ORyn$="N"
4410 UNTIL yn$="Y":PROCflash(0)
4420 =name$
4430 :
4440 DEF PROCload
4450 REPEAT
4460 CLS:PRINT"Enter"'"filename"'">";
4470 INPUT""name$
4480 ch%=OPENIN(name$)
4490 l%=EXT#ch%:CLOSE#0:ok%=TRUE
4500 IF l%=0 PRINT'"No such"'"file.":ok
%=FALSE
4510 IF l%<>&C18 AND ok% PRINT'"Not a"'
"Music"'"file.":ok%=FALSE
4520 IF NOT ok% PRINT'"<SPACE>";:q%=GET
4530 UNTIL ok%:PROCflash(0)
4540 CLS:PRINTFNdouble("Reading.")
4550 ch%=OPENIN(name$)
4560 INPUT#ch%,key$,nk%
4570 FOR I%=0 TO 2
4580 INPUT#ch%,n%(I%):NEXT
4590 FOR I%=c1% TO &5800
4600 ?I%=BGET#ch%
4610 NEXT:CLOSE#0
4620 P%=0:N%=1:S%=0:pp%=-1
4630 nn%=-1:ss%=-1
4640 CLS:PROCscrn:ENDPROC
4650 :
4660 DEF PROCfinal
4670 name$=FNname
4680 CLS:PRINTFNdouble("Writing.")
4690 ch%=OPENOUT(name$)
4700 BPUT#ch%,6:BPUT #ch%,0
4710 add%=6:FOR I%=0 TO 1
4720 J%=0:REPEAT
4730 p%=?(&4C00+I%*&400+J%)
4740 d%=?(&4C01+I%*&400+J%)
4750 IF p%<>0 OR d%<>0 add%=add%+2
4760 IF p%=254 add%=add%+12
4770 J%=J%+2:UNTILJ%=&400:add%=add%+16
4780 BPUT#ch%,add% MOD 256
4790 BPUT#ch%,add% DIV 256
4800 NEXT
4810 FOR I%=0 TO 2
4820 PRINT'FNdouble("Voice "+STR$(I%+1)
)
4830 PROCwrenv(1)
4840 FOR J%=0 TO &3FE STEP 2
4850 p%=?(&4C00+I%*&400+J%)
4860 d%=?(&4C01+I%*&400+J%)
4870 IF p%=&FE PROCwrenv(d%) ELSE PROCw
rnote
4880 NEXT
4890 BPUT#ch%,255:BPUT#ch%,255
4900 NEXT:CLOSE#0
4910 VDU 12,26:ENDPROC
4920 :
4930 DEF PROCwrenv(d%)
4940 BPUT #ch%,&FE
4950 FOR by%=1 TO 13
4960 BPUT #ch%,?(&9F0+d%*16+by%):NEXT
4970 p%=0:d%=0
```

Continued ▶

◀ *Theme* listing 2 continued

```
 4980 ENDPROC
 4990 :
 5000 DEF PROCwrnote
 5010 a%=(p%/32)AND3:p%=p%AND31
 5020 p%=P%(p%)+ac%(a%,a%(p%))
 5030 IF p%<>0 OR d%<>0 BPUT #ch%,p%:BPU
T #ch%,d%
 5040 ENDPROC
 5050 :
 5060 DEF PROCtempo
 5070 T%=VAL(k$):VDU 31,39,12,ASC(k$)
 5080 ENDPROC
 5090 :
 5100 DEF PROCenvel
 5110 PROCnote(S%,N%,pi%,du%,1)
 5120 IF pi%=0 AND du%=0 n%(S%)=n%(S%)+1
:PRINTFNnumb(S%)
 5130 pi%=&FE:du%=1:GCOL0,0
 5140 PROCshowe(S%,N%,du%)
 5150 ?ad%=pi%:ad%?1=du%
 5160 ENDPROC
 5170 :
 5180 DEF PROCdump
 5190 VDU 28,32,31,39,14
 5200 PRINTFNdouble("Printer")''FNdouble
("Dump")
 5210 PRINT''"Sure ?";:*FX 21,0
 5220 PROCflash(1)
 5230 REPEAT:yn$=GET$
 5240 UNTIL yn$="Y" OR yn$="N"
 5250 IF yn$="N" VDU 12,26:PROCflash(0):
ENDPROC
 5260 LOCAL X%,Y%,Z%,A%,B%,C%
 5270 CLS:PRINTFNdouble("Dump key")'FNdo
uble("sig ?");CHR$10;
 5280 REPEAT:ks$=GET$
 5290 UNTIL ks$="Y" OR ks$="N"
 5300 IF ks$="Y" C%=0 ELSE C%=160
 5310 PROCflash(0):PROCcurs(S%,N%)
 5320 PROCnote(S%,N%,pi%,du%,0)
 5330 CLS:PRINTFNdouble("Dumping.")
 5340 VDU 2,1,27,1,65,1,8,1,10
 5350 FOR X%=C% TO 960 STEP 32
 5360 VDU 2,1,27,1,76,1,208,1,2
 5370 FOR Y%=0 TO 960 STEP 4
 5380 A%=0:FOR Z%=0 TO 7
 5390 IF POINT(X%+Z%*4,Y%)=0 A%=A%+2^(7-
Z%)
 5400 NEXT:VDU 1,A%,1,A%,1,A%
 5410 NEXT:VDU 1,10
 5420 NEXT:VDU 1,27,1,64,3,7
 5430 PROCcurs(S%,N%):VDU 12,26
 5440 PROCnote(S%,N%,pi%,du%,0)
 5450 ENDPROC
 5460 :
 5470 DATA 134,131,134,130,133,130,132,1
30,132,129,9,128
 5480 DATA 156,159,155,159,155,158,155,1
57,154,157,128,9
 5490 :
 5500 DATA 0,0,0,8,4,0,0,-4,-8,4,0,-4
 5510 :
 5520 DATA 5,13,21,25,33,41,49,53,61,69,
73,81,89,97,101,109,117
 5530 DATA 121,129,137,145,149,157,165,1
69,177,185,193,197
 5540 :
 5550 DATA 135,130,270,98,238,138,278,11
0,250,150,218
 5560 DATA 136,86,226,114,254,74,214,106
,246,66,206
 5570 :
 5580 DATA 4,1,5,2,6
 5590 DATA 7,3,6,2,5
```

See Sing Along A Micro, page 90

Listing 1. Ample sample

```
"play" [] "setup" [] "riffA" [] "riffB"
[] "riffC" [] "riffD" [] "score1" []
"score2" [] "score3" [] "score4" []
"score5" [] "part2B" [] "part2C" []
"part2D" [] "part3B" [] "part3C" []
"part3D" [] "part4B" [] "part4C" []
"part4D" [] "part5B" [] "part5C" []
"part5D" [] "adlibsound" [] "ins3" []
"ins4" [] "wave1" [] "wave2" [] "wave3"
[] "wave4" [] "env1" [] "env2" []
"env3" [] "env4" [] "riffE" []
"solovoice" []  "barsrest" [] "riffF"
[] "ins2" []  "keyC" []"keyFsharp" []
"keyA" [] "env6" [] "bass" []
```

Listing 2. Sunrise-Sunset listing

```
10."play" [setup 0 VOICES 5 PLAYERS 1400
20.TEMPO 1PLAY(score1)PLAY
30.2PLAY(score2)PLAY 3PLAY(score3)PLAY
40.4PLAY(score4)PLAY 5PLAY(score5)PLAY
50.GO]
RUN CLEAR

10."setup" [1WMOD wave1 2WMOD wave2
20.3WMOD wave3 4WMOD wave4 13 WMOD WZERO
30.WHG WGC 1EMOD env1 2EMOD env2 3 EMOD
40.env3 4EMOD env4 6 EMOD env6]
RUN CLEAR

10."wave1" [WZERO 128 1 WH! 125 2 WH!
20.120 3 WH! 115 4 WH! 90 6 WH! 40 14
30.WH! WHG WGC]
RUN CLEAR

10."wave2" [WZERO 128 1 WH! 125 2 WH!
20.120 6 WH! 100 10 WH! 40 15 WH! WHG
30.WGC]
RUN CLEAR

10."wave3" [WZERO 128 1 WH! 125 3 WH!
20.100 5 WH! 90 7 WH! WHG WGC]
RUN CLEAR

10."wave4" [WZERO 128 1 WH! 120 2 WH!
20.110 4 WH! 100 6 WH! WHG WGC]
RUN CLEAR

10."env1" [20 5 CYCLE]
RUN CLEAR

10."env2" [ADSR 1 ATTACK 50 DECAY 120
20.SUSTAIN 300 RELEASE]
RUN CLEAR

10."env3" [ADSR 1 ATTACK 10 DECAY 115
20.SUSTAIN 30 RELEASE]
RUN CLEAR

10."env4" [ADSR 5 ATTACK 300 DECAY 115
20.SUSTAIN 500 RELEASE]
RUN CLEAR

10."env6" [ADSR 1 ATTACK 100 DECAY 0
20.SUSTAIN]
RUN CLEAR

10."adlibsound" [2 CHANS SOUND ON CHAN
20.128 AMP 4 WAVE 4 AENV 1 PENV -1 POS 1
30.CHAN ON INVERT 50 OFFSET 1 POS]
RUN CLEAR
```

Continued ▶

◀ **Ample listing 2 continued**

```
10."solovoice" [ 4 CHANS SOUND ON CHAN
20.128 AMP EVEN CHAN 1 WAVE 1 PENV 2
30.AENV ODD CHAN 2 WAVE 3 AENV 1 CHAN ON
40.RM 50 OFFSET 2 CHAN ON INVERT 5 FM
50.500 OFFSET 3 CHAN ON INVERT 250
60.OFFSET 4 CHAN 100 FM]
RUN CLEAR

10."ins2" [2 CHANS SOUND ON CHAN 128 AMP
20.2 WAVE 2 AENV 1 CHAN 5 FM ON INVERT]
RUN CLEAR

10."ins3" [2 CHANS SOUND ON CHAN 124 AMP
20.3 WAVE 2 AENV 1 CHAN ON RM 30 OFFSET]
RUN CLEAR

10."ins4" [2 CHANS SOUND ON CHAN 128 AMP
20.4 WAVE 3 AENV 1 PENV 1 CHAN ON INVERT
30.300 OFFSET]
RUN CLEAR

10."bass" [4 CHANS SOUND ON CHAN 128 AMP
20.ODD CHAN ON SYNC 4 PENV 4 AENV 1 CHAN
30.2 WAVE 1 PENV 2 AENV ON INVERT 3 CHAN
40.3 WAVE 3 AENV 500 OFFSET 2 CHAN 13
50.WAVE 4 CHAN 4 WAVE 4 AENV 1 PENV]
RUN CLEAR

10."riffA" [-2:96,C72,-b24,C|
20.48,/-b72,D24,c|
30.72,-bC48,D|24,/72,-b48,C-b|]
RUN CLEAR

10."riffB" [0:12,-2POS gCDG 2POS ADaG
20.-2POS Agdc 2POS gAdc|32,0POS gDADGg|]
RUN CLEAR

10."riffC" [0:16,3POS gGA 2POS GAd 1POS
20.gAe 0POS cDa|24,-1POS DA72,D24,-2POS
30.G48,c|96,-3POS a48,ed|]
RUN CLEAR

10."riffD" [2:RAND? 200#/ #12 #2 10#+
20.DURATION RAND? 20#/ #12 #2
30.15#+,Ag+fe20,+FG48,+f0,^]
RUN CLEAR

10."riffE" [2:18,A16,g14,+f
20.12,e20,+c30,b210,+C0,^]
RUN CLEAR

10."riffF" [0:12,-2POS cDE -1POS cDE
20.0POS cDE 1POS cDE 2POSAgAe|]
RUN CLEAR

10."score1" [adlibsound 1700 DURATION 33
20.RAND! 6FOR(riffD)FOR 1000 DURATION
30.riffE 7800 DURATION 8FOR(riffD)FOR
40.0,^]
RUN CLEAR

10."score2" [ins2 3barsrest
20.16FOR(riffF)FOR
30.12,+FeG+fBa+Cb16,+D+D+D24,+D+D|
40.12,+E+d+E//+d+E/+d/+E/+d///|@
50.solovoice 0 POS part2B 2FOR(part2C
60.part2B)FOR part2D @ ins2
70.10FOR(riffF)FOR 0,^ 6barsrest]
RUN CLEAR

10."score3" [ins3 7barsrest
20.4FOR(riffC)FOR 2POS
30.24,E+F^+C/+F//|12,+Cb+C//b+C/+f+c+f/
```

Continued ▶

◀ **Ample listing 2 continued**

```
40.48,/| part3B 2FOR(part3C part3B)FOR
50.part3D 4FOR(riffC)FOR 0,^ 4barsrest]
RUN CLEAR

10."score4" [ins4 4barsrest
20.7FOR(riffB)FOR -2POS
30.16,eGADGA^^^+fdc|24,bb^^b//b|
40.+g+g^+g+g+g^+g|  part4B 2FOR(part4C
50.part4B)FOR part4D 7FOR(riffB)FOR @1
60.CHAN 20 FM 2 CHAN 300 OFFSET 1
70.barsrest 192,gg48,d600,g0,^]
RUN CLEAR

10."score5" [bass -1POS 4FOR(riffA)FOR
20.1200 TEMPO 48,D^24,DD48,E| 1000 TEMPO
30.96,/24, dE48,/|950 TEMPO
40.24,/72,dE24,+F|48,/ 925 TEMPO / 850
50.TEMPO / 800 TEMPO /|24,+e+e 875 TEMPO
60.^+e+e 925 TEMPO +e^ 875 TEMPO +e| 800
70.TEMPO @1 POS ON CHAN 6 AENV part5B
80.2FOR(part5C part5B)FOR part5D 1300
90.TEMPO @ON CHAN 2 AENV -1POS
100.4FOR(riffA)FOR @1 CHAN -2POS 3 CHAN
110.2POS 768,C0,^]
RUN CLEAR

10."part2B" [keyFsharp 0:24,FF^cF^C/|
20.//F///| Bagfe/cG|144,/|
30.<24,ff^cF^C/|//96,>C|]
RUN CLEAR

10."part2C" [24,fGABcDGf|96,/e|keyA
20.24,cc^bC/a/|144,B24,fA|BB^aB/E/|144,c
30.48,^|24,cc^bC/a/|144,B24,fA|
40.BCEFCgfG|96,f^|]
RUN CLEAR

10."part2D" [keyFsharp 24
20.fGABcDFG|192,/|keyC 48,Ba//|192,^|]
RUN CLEAR

10."part3B" [keyFsharp 192
20.A|48,g/A|96,fG|B48,f|96,Af|144,e|]
RUN CLEAR

10."part3C" [24,F72,dE24,E|32
20.FCbagf|keyA @ON CHAN 3AENV 24
30.eeeeeeee|GGGGAAAA|B=gB=g^=gB=g|
40.ee^eGG^G|eeeeeeee|GGGGfBfd|
50.+d+d^+d+d+d^+d|@ON CHAN 2 AENV 48
60.c//b|]
RUN CLEAR

10."part3D" [keyFsharp 96,d=E| keyC 6,E
20.15FOR(Fe)FOR F |6,F 15FOR(Gf)FOR G |
30.6,G 15FOR(Ag)FOR A | 0,^ ]
RUN CLEAR

10."part4B" [keyFsharp 48,cccc|E
20.24,c//F|48,ddcc|DDD|cA/A|ggg|]
RUN CLEAR

10."part4C" [24,g/f/edc/|48,aB32
20.CDc|keyA 24,/cc^^cc^|^EE^^dd^|
30.^dd^^EE^|^EE^^Eb^|^CC^^CC^|^EE^^dd^|
40.FFF^BBB^|48,+a/+e+d|]
RUN CLEAR

10."part4D" [keyFsharp 24,g/f/G//f|keyC
20.ebb^^bbb|^^aaa^^a|gg^^^gG>G|0,^]
RUN CLEAR
```

Continued ▶

◀ **Ample listing 2 continued**

```
10."part5B" [keyFsharp
20.-2:24,ff^^^Cff|cc^^FF|BB^^^gCC|
30.gg^^BB|ff^^^Cff|cc^^GG|]
RUN CLEAR

10."part5C" [24,BB^BCC^g|fC/fGC/g|keyA
20.144,A24,^A|E//bD//a|=g/////^e|
30.AE/aBE/b|a/////^a|E//bD//a|BB^Bff^B|
40.fC/f+GCfB|]
RUN CLEAR

10."part5D" [keyFsharp 24,BB^BCC^g|keyC
20.900 TEMPO eee^ 1000 TEMPO ^eee|^ 1080
30.TEMPO ^ddd^^c| 1130 TEMPO cc^^^c 1200
40.TEMPO cc|0,^]
RUN CLEAR

10."barsrest" [192 #*,^]
RUN CLEAR

10."keyC" [K()K]
RUN CLEAR

10."keyFsharp" [K(+F+C+G+D+A+E)K]
RUN CLEAR

10."keyA" [K(+F+C+G)K]
RUN CLEAR
```

See Doing It On The Side, page 96

Listing 1. Sideways printing

```
  10 REM Sideways printing
  20 REM By John Knight
  30 REM For BBC B/B+/M/C
  40 REM (c) Acorn User April 1987
  50 :
  60 ON ERROR GOTO 220
  70 VDU 3:MODE 7
  80 PROConceonly
  90 :
 100 REPEAT
 110 line=0:ptr%(line)=0
 120 REPEAT
 130 PROCfindlines
 140 PROCreadfile
 150 UNTIL morelines=FALSE
 160 PROCagain
 170 UNTIL again$="N"
 180 MODE 7
 190 END
 200 :
 210 REM Error Handler
 220 VDU 3,7:REPORT
 230 IF ERR=17 THEN END
 240 PRINT" in line " ERL
 250 PRINT''"Press any key to continue"
;
 260 key=GET
 270 RUN
 280 END
 290 :
 300 DEF FNquery(q$)
 310 PRINT q$;
 320 INPUT""q$
 330 =q$
 340 :
 350 DEF FNgetletter
 360 S%=ptr%(line)
 370 B%=text?S%
 380 IF B%=13 OR B%=0 THEN =32
 390 ptr%(line)=ptr%(line)+1
```

Continued ▶

◀ **Sideways printing listing 1 continued**

```
 400 IF B%<32 GOTO 360
 410 activelines=activelines+1
 420 =B%
 430 :
 440 DEF FNgetbyte
 450 sub=sub+1
 460 =text?sub
 470 :
 480 DEF PROConceonly
 490 PROCsetlimits
 500 FOR A%=0 TO maxwidth
 510 ptr%(A%)=-1
 520 NEXT
 530 PROCmccode
 540 PRINTSPC(8);"ViewSheet Printer"
 550 PRINTSPC(8);"================="
 560 VDU 28,0,24,39,6,12
 570 sub=0
 580 ENDPROC
 590 :
 600 DEF PROCfindlines
 610 IF NOT morelines PROCgetfile
 620 VDU 3,12
 630 PRINT''"Please wait:"
 640 PRINT"Assembling line pointers.";
 650 PROCfindcrs
 660 morelines=FALSE
 670 IF sub<size THEN IF line>=pagelen
morelines=TRUE
 680 IF line=-1 PRINT "File Empty":VDU
7:END
 690 ENDPROC
 700 :
 710 DEF PROCfindcrs
 720 REPEAT
 730 REPEAT UNTIL FNgetbyte=13 OR NOT (
sub<size)
 740 PRINT".";
 750 IF sub>=size GOTO 770
 760 line=line+1 :ptr%(line)=sub+1
 770 UNTIL sub>=size OR line>=pagelen
 780 ENDPROC
 790 :
 800 DEF PROCreadfile
 810 L%=line
 820 VDU 12,2,1,27,1,ASC"@"
 830 VDU 1,27,1,ASC"A",1,8
 840 PRINT"Printing in progress.."
 850 n1=maxdots MOD 256
 860 n2=maxdots DIV 256
 870 VDU 1,13,1,10
 880 REPEAT
 890 activelines = 0
 900 VDU 1,27,1,ASC"L",1,n1,1,n2
 910 FOR line = pagelen TO 0 STEP-1
 920 IF line>L% A%=32 ELSE A%=FNgetlett
er
 930 CALLvducode
 940 NEXT
 950 VDU 1,13,1,10
 960 UNTIL activelines=0
 970 ENDPROC
 980 :
 990 DEF PROCsetlimits
1000 DIM ostext 50,code 100
1010 maxtextsize=&5000
1020 DIM text maxtextsize+4
1030 maxdots=960
1040 maxwidth=(maxdots/10)-1
1050 DIM ptr%(maxwidth)
1060 morelines=FALSE
1070 ENDPROC
1080 :
1090 DEF PROCagain
```

Continued ▶

◄ **Sideways printing listing 1 continued**

```
1100 VDU 3,12 :
1110 PRINT"Print another Sheet";
1120 REPEAT
1130 again$=CHR$( ASC(FNquery("(Y/N) ?"
) ) AND &DF)
1140 UNTIL again$="Y" OR again$="N"
1150 ENDPROC
1160 :
1170 DEF PROCgetfile
1180 CLS
1190 PRINT"Enter Filename or * Command:
"
1200 VDU 28,0,24,39,7,12
1210 REPEAT
1220 file$=FNquery(">=")
1230 oscomm=(LEFT$(file$,1) = "*")
1240 IF NOT oscomm PROCgetfilesize ELSE
size=0 :PROCoscli(file$)
1250 UNTIL (NOToscomm) AND (size> 0)
1260 IF size> maxtextsize PRINT"Too big
-   for now...":END
1270 PROCoscli("LOAD "+file$+"  "+STR$~
(text) )
1280 text!size = 0
1290 PRINT "Double or Single height ";
1300 REPEAT
1310 double$=CHR$( ASC(FNquery("(D/S) ?
") ) AND &DF)
1320 UNTIL double$="D" OR double$="S"
1330 IF double$="D" ?double=1 ELSE ?dou
ble=0
1340 IF double$="D" dots=20 ELSE dots=1
0
1350 pagelen=(maxdots/dots)-1
1360 sub=-1 :VDU 28,0,24,39,6
1370 ENDPROC
1380 :
1390 DEFPROCgetfilesize
1400 size=EXT#(OPENIN(file$)):CLOSE #0
1410 IF size<1 PRINT "No such data!"''
1420 ENDPROC
1430 :
1440 DEF PROCoscli(star$)
1450 $ostext=star$
1460 X%=ostext MOD 256
1470 Y%=ostext DIV 256
1480 CALL&FFF7
1490 ENDPROC
1500 :
1510 DEF PROCmccode
1520 osword=&FFF1:oswrch=&FFEE
1530 FOR pass=0 TO 2 STEP 2
1540 P%=code
1550 [OPT pass
1560 .double
1570 NOP
1580 .block
1590 NOP:NOP:NOP
1600 NOP:NOP:NOP
1610 NOP:NOP:NOP
1620 \
1630 .vducode
1640 STA block
1650 LDA #10
1660 LDX #block MOD 256
1670 LDY #block DIV 256
1680 JSR osword
1690 LDX #8
1700 \
1710 .vdulloop
1720 LDA #1        :JSR oswrch
1730 LDA block,X   :JSR oswrch
1740 LDA double    :BEQ nextline
```

Continued ►

◄ **Sideways printing listing 1 continued**

```
1750 LDA #1        :JSR oswrch
1760 LDA block,X   :JSR oswrch
1770 .nextline
1780 DEX           :BNE vdulloop
1790 LDA double    :BEQ normspc
1800 LDA #1        :JSR oswrch
1810 LDA #0        :JSR oswrch
1820 LDA #1        :JSR oswrch
1830 LDA #0        :JSR oswrch
1840 .normspc
1850 LDA #1        :JSR oswrch
1860 LDA #0        :JSR oswrch
1870 LDA #1        :JSR oswrch
1880 LDA #0        :JSR oswrch
1890 RTS
1900 ]
1910 NEXT
1920 ENDPROC
```

See Presenting Pointer Picture, page 104

Listing 1. Picking coloured boxes

```
  10 REM Pointer Listing 1
  20 REM by Dave Atherton
  30 REM Compact only
  40 REM (c) Acorn User April 1987
  50 :
  60 ON ERROR GOTO 380
  70 MODE 129
  80 VDU 23,1|
  90 *KEYS 0
 100 *POINTER 0
 110 PROCsetup
 120 PRINTTAB(4,30)"Move cursor keys th
en press COPY"
 130 *KEYS
 140 *POINTER
 150 *FX22
 160 REPEAT
 170 X%=ADVAL 7
 180 Y%=ADVAL 8
 190 UNTIL (ADVAL(0)AND1) OR INKEY-106
 200 *FX15
 210 p=POINT(X%-4,Y%+8)
 220 PRINTTAB(4,30)"     You picked colo
ur ";p;SPC 9;
 230 GOTO 160
 240 :
 250 DEFPROCsetup
 260 VDU 24,0;200;1279;1023;
 270 FOR i=1 TO 15
 280 PROCbox(i)
 290 NEXT
 300 ENDPROC
 310 :
 320 DEFPROCbox(x)
 330 GCOL0,x
 340 MOVE RND(1280),RND(1024)
 350 PLOT 101,RND(1280),RND(1024)
 360 ENDPROC
 370 :
 380 *FX23
 390 *POINTER 0
 400 *KEYS 0
 410 *FX4
 420 VDU23,1,1|
 430 PRINTTAB(0,31);
 440 END
```

Listing 2. Selecting an item from a menu

```
   10 REM Pointer-Listing 2
   20 REM by Dave Atherton
   30 REM Compact only
   40 REM (c) Acorn User April 87
   50 :
   60 ON ERROR GOTO 390
   70 MODE129
   80 VDU19,1,6;23,1;
   90 *KEYS 0
  100 *POINTER 0
  110 PROCsetup
  120 VDU31,2,28,136
  130 PRINT" Pointer"
  140 *KEYS
  150 *POINTER
  160 *FX22
  170 REPEAT
  180 X%=ADVAL 7
  190 Y%=ADVAL 8
  200 PRINTTAB(0,28);(13-Y% DIV 64)" "
  210 UNTIL (ADVAL(0)AND1) OR INKEY-106
  220 *FX15
  230 P%=(13-Y% DIV 64)
  240 PRINTTAB(8,30)"You picked menu ite
m ";P%
  250 GOTO170
  260 :
  270 DEFPROCsetup
  280 READ title$
  290 PRINTTAB((40-LEN title$)/2,2) titl
e$
  300 READ N
  310 PRINTTAB(0,6);
  320 FOR I=1 TO N
  330 READ I$
  340 PRINTI;". ";I$
  350 PRINT
  360 NEXT
  370 ENDPROC
  380 :
  390 *FX23
  400 *FX4
  410 *POINTER 0
  420 *KEYS 0
  430 VDU23,1,1;
  440 PRINTTAB(0,30);
  450 IF ERR<>17 THEN REPORT:PRINT" at "
;ERL
  460 END
  470 :
  480 DATA Program Menu,5
  490 DATA Program One,Program Two
  500 DATA Program Three,Program Four
  510 DATA Program Five
```

Listing 3. Animated sprites

```
   10 REM Compact Listing 3
   20 REM by Dave Atherton
   30 REM Compact or B/B+ with GXR
   40 REM (c) Acorn User April 1987
   50 :
   60 MODE 128
   70 *SPRITE
   80 GCOL3,1
   90 *FX4 1
  100 X%=640:Y%=512
  110 *SCHOOSE 1
  120 REPEAT
  130 PLOT&ED,X%,Y%
  140 A%=GET AND &7F
  150 PLOT&ED,X%,Y%
  160 IFA%=8 THEN X%=X%-16
  170 IFA%=9 THEN X%=X%+16
```

Continued ▶

◀ Pointer listing 3 continued

```
  180 IFA%=10 THEN Y%=Y%-4
  190 IFA%=11 THEN Y%=Y%+4
  200 UNTIL FALSE
  210 END
```

See First Byte, page 49

Listing 1. Memory ROM creator

```
   10 REM Memory ROM Creator
   20 REM by Tessie Revivis
   30 REM for Master and Compact
   40 REM (C) Acorn User April 1987
   50 :
   60 MODE 7
   70 PROCassemble
   80 PRINT"Writing ROM image.."
   90 *SRWRITE 5000 5105 8000 6
  100 PRINT"Press CTRL-BREAK"
  110 END
  120 :
  130 DEF PROCassemble
  140 PRINT"Assembling Data..."
  150 c%=0:base=&5000
  160 FOR loop=0 TO &105
  170 READ byte
  180 c%=c%+byte
  190 base?loop=byte
  200 NEXT
  210 IF c%=31709 THEN ENDPROC
  220 VDU 7
  230 PRINT"Error in Data - re-check"
  240 END
  250 :
  260 DATA 0,0,0,76,33,128,130,25
  270 DATA 1,77,101,109,111,114,121,32
  280 DATA 82,79,77,32,49,46,48,48
  290 DATA 0,0,40,67,41,32,88,88
  300 DATA 0,201,4,240,1,96,72,90
  310 DATA 218,136,162,255,200,232,177,2
42
  320 DATA 41,223,221,254,128,240,245,18
9
  330 DATA 254,128,201,255,240,3,76,250
  340 DATA 128,162,255,232,189,218,128,2
40
  350 DATA 5,32,238,255,208,245,165,1
  360 DATA 56,229,24,133,129,165,0,233
  370 DATA 0,133,128,32,157,128,32,135
  380 DATA 128,162,255,232,189,235,128,2
40
  390 DATA 5,32,238,255,208,245,56,165
  400 DATA 6,229,0,133,128,165,7,229
  410 DATA 1,133,129,32,157,128,32,135
  420 DATA 128,250,122,104,169,0,96,162
  430 DATA 255,232,189,149,128,240,5,32
  440 DATA 227,255,208,245,96,32,98,121
  450 DATA 116,101,115,13,0,162,4,169
  460 DATA 0,149,112,56,165,128,253,208
  470 DATA 128,168,165,129,253,213,128,1
44
  480 DATA 8,133,129,132,128,246,112,208
  490 DATA 235,202,16,227,162,5,202,240
  500 DATA 4,181,112,240,249,181,112,9
  510 DATA 48,32,238,255,202,16,246,96
  520 DATA 1,10,100,232,16,0,0,0
  530 DATA 3,39,80,114,111,103,114,97
  540 DATA 109,32,108,101,110,103,116,10
4
  550 DATA 58,32,0,77,101,109,111,114
  560 DATA 121,32,102,114,101,101,32,58
  570 DATA 32,0,250,122,104,96,77,69
  580 DATA 77,79,82,89,255,102,102,0
```

Continued ▶

First Byte listing 2

```
10 REM *SRDATA demo
20 REM Tessie Revivis
30 REM for B+128/Master/Compact
40 REM (C) Acorn User April 1987
50 :
60 *SRDATA W
70 *SRDATA X
80 *SRDATA Y
90 *SRDATA Z
100 offset=0
110 FOR loop=1 TO 4
120 GCOL 0,1
130 MODE 4
140 READ a,b,c,d,e,f
150 MOVE a,b
160 MOVE c,d
170 PLOT 85,e,f
180 A$="SRWRITE 5000 8000 "
190 B$=STR$~(offset)
200 OSCLI(A$+B$)
210 offset=offset+&3000
220 NEXT
230 key=GET
240 MODE 4
250 :
260 REPEAT
270 offset=0
280 A$="SRREAD 5000 8000 "
290 FOR loop=1 TO 4
300 B$=STR$~(offset)
310 OSCLI(A$+B$)
320 offset=offset+&3000
330 NEXT
340 UNTILO
350 :
360 *SRREAD 3000 3000 0
370 *SRREAD 3000 3000 3000
380 *SRREAD 3000 3000 6000
390 *SRREAD 3000 3000 9000
400 UNTILO
410 :
420 DATA 0,0,1000,0,500,500
430 DATA 1000,0,500,500,1000,1000
440 DATA 500,500,1000,1000,0,1000
450 DATA 0,1000,500,500,0,0
```

See Hints & Tips, page 41

Listing 1. Displays 256 bytes of memory

```
10 REM Hints & Tips - Listing 1
20 REM By Martin Phillips
30 REM For BBC B/B+/M/E/C
40 REM (c) Acorn User April 1987
50 :
60 @%=3
70 VDU 14
80 a$=" "
90 b$=" "
100 INPUT "Start at page &" start$
110 page=EVAL("&" + start$)
120 FOR location=page TO page+&FF STEP
 8
130 PRINT "&"; ~location; a$;
140 B$=b$
150 FOR line=0 TO 7
160 contents=location?line
170 PRINT ~contents;
180 IF contents<32 OR contents>126 THE
N contents=46
```

Continued ▶

◀ Hints & Tips listing 1 continued

```
190 B$=B$ + CHR$(contents)
200 NEXT line
210 PRINT B$
220 NEXT location
```

Listing 2. Strips control codes from wordprocessor files

```
10 REM Hints & Tips - Listing 2
20 REM By Martin Phillips
30 REM FOR B/B+/M/E/C
40 REM (c) Acorn User April 1986
50 :
60 CLS
70 INPUT "Start point = &"S$
80 INPUT "File length = &"L$
90 S%=EVAL("&"+S$)
100 E%=S%+EVAL("&"+L$)
110 FOR N%=S% TO E%
120 IF ?N%<32 OR ?N%>126 THEN ?N%=32
130 NEXT N%
140 REPEAT
150 S%=S%+1
160 PRINT TAB(5,5); "At point &"; ~S%;
170 IF ?S%=32 AND (S%?-1)=32 PROCshuff
le
180 UNTIL S%>=E%
190 PRINT TAB(0,10)"Finished"
200 PRINT "New file length is &"; ~(E%
-(EVAL("&"+S$)))
210 END
220 :
230 DEF PROCshuffle
240 s%=0
250 REPEAT
260 s%=s%+1
270 UNTIL S%?s%<>32 OR s%+S%>=E%
280 FOR N%=S% TO E%
290 ?N%=N%?s%
300 NEXT N%
310 E%=E%-s%
320 ENDPROC
```

Listing 3. Tree game listing

```
10 REM Hints & Tips - Listing 3
20 REM By Martin Phillips
30 REM For BBC B/B+/M/C
40 REM (c) Acorn User April 1987
50 :
60 MODE 7
70 PROCinit
80 PROCload
90 PROCrun
100 PROCsave
110 END
120 :
130 DEF PROCinit
140 S%=&3000:E%=S%+4:a%=40
150 b%=44:c%=48:os%=&A00
160 $E%="Has it four legs"
170 E%!a%=E%+c%:E%!b%=E%+2*c%:E%=E%+c%
180 $E%="A dog"
190 E%!a%=0:E%!b%=0:E%=E%+c%
200 $E%="A sparrow"
210 E%!a%=0:E%!b%=0:E%=E%+c%
220 ENDPROC
230 :
240 DEF PROCrun
250 P%=S%+4
```

Continued ▶

◄ Hints & Tips listing 3 continued

```
   260 VDU 26,12
   270 PRINT CHR$141; SPC(12); "The Tree
 Game"
   280 PRINT CHR$141; SPC(12); "The Tree
 Game"
   290 VDU 28,0,24,39,4
   300 PRINT "Are you thinking of an anim
 al? ";
   310 PROCinput
   320 IF A$="N" THEN ENDPROC
   330 IF P%!a%=0 THEN PRINT "Is it ";
   340 PRINT $P%; " ";
   350 PROCinput
   360 IF A$="Y" AND P%!a%=0 PRINT "I win
 !":I=INKEY(500):GOTO 250
   370 IF A$="N" AND P%!b%=0 PROCgetquest
 ion:GOTO 250
   380 IF A$="Y" AND P%!a%>0 P%=P%!a%:GOT
 O 330
   390 IF A$="N" AND P%!b%>0 P%=P%!b%:GOT
 O 330
   400 ENDPROC
   410 :
   420 DEF PROCinput
   430 REPEAT
   440 A$=GET$
   450 UNTIL A$="Y" OR A$="N"
   460 IF A$="Y" THEN PRINT "Yes"' ELSE P
 RINT "No"'
   470 ENDPROC
   480 :
   490 DEF PROCgetquestion
   500 PRINT "What were you thinking of?"
   510 INPUT object$
   520 IF LEN(object$)>39 THEN PRINT "Tex
 t too long":VDU 7:GOTO 500
   530 PRINT "Tell me a question that wil
 l distinguishbetween "$P%" and "object$
   540 INPUT question$
   550 IF LEN(question$)>39 THEN PRINT "T
 ext too long":VDU 7:GOTO 530
   560 PRINT "What would the answer be fo
 r"'$P%
   570 PROCinput
   580 $E%=$P%:$P%=question$
   590 E%!a%=0:E%!b%=0:E%=E%+c%
   600 $E%=object$:E%!a%=0
   610 E%!b%=0:E%=E%+c%
   620 IF A$="Y" P%!a%=E%-2*c%:P%!b%=E%-c
 %:ENDPROC
   630 P%!a%=E%-c%:P%!b%=E%-2*c%
   640 ENDPROC
   650 :
   660 DEF PROCload
   670 CLS
   680 PRINT'"Have you a tree to load? ";
   690 PROCinput
   700 IF A$="N" THEN ENDPROC
   710 *LOAD TREE
   720 E%=!S%
   730 ENDPROC
   740 :
   750 DEF PROCsave
   760 !S%=E%
   770 PROCoscli("SAVE TREE "+STR$~S%+" "
 +STR$~E%)
   780 ENDPROC
   790 :
   800 DEF PROCoscli($os%)
   810 X%=os% MOD 256:Y%=os% DIV 256
   820 CALL &FFF7
   830 ENDPROC
```

Listing 4. Tree Game editor

```
   10 REM Hints & Tips - Listing 4
   20 REM By Martin Phillips
   30 REM For BBC B/B+/M/C
   40 REM (c) Acorn User April 1987
   50 :
   60 MODE 7
   70 os%=&A00
   80 PROCload
   90 PROCedit
  100 PROCsave
  110 END
  120 :
  130 DEF PROCedit
  140 VDU 26,12
  150 PRINT CHR$141; SPC(10); "The Tree
 Game Editor"
  160 PRINT CHR$141; SPC(10); "The Tree
 Game Editor"
  170 PRINT'"Enter new text or press RET
 URN"
  180 VDU 28,0,24,39,5
  190 S%=&3000
  200 FOR N%=S%+4 TO E%-1 STEP 48
  210 PRINT '" "$N%
  220 INPUT temp$
  230 IF LEN(temp$)>39 PRINT"Text too lo
 ng":VDU7:GOTO 210
  240 IF temp$>"" $N%=temp$
  250 NEXT N%
  260 ENDPROC
  270 :
  280 DEF PROCload
  290 *LOAD TREE
  300 E%=!S%
  310 ENDPROC
  320 :
  330 DEF PROCsave
  340 !S%=E%
  350 PROCoscli("SAVE TREE "+STR$~S%+" "
 +STR$~E%)
  360 ENDPROC
  370 :
  380 DEF PROCoscli($os%)
  390 X%=os% MOD256:Y%=os% DIV256
  400 CALL &FFF7
  410 ENDPROC
```

Listing 5. Removes embedded commands

```
  115 PROCwordwise
  330 :
  340 DEF PROCwordwise
  350 PRINT "Removing embedded commands"
  360 FOR N%=S% TO E%
  370 IF ?N%<>2 THEN GOTO 410
  380 REPEAT
  390 ?N%=32:N%=N%+1
  400 UNTIL ?N%=7
  410 NEXT N%
  420 ENDPROC
```

April listings

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We will be stocking the range of Amstrad PC1512, Opus PC II and Tandon computers along with software titles such as VP Planner, VP Info, Executive Writer, Supercalc 3, Wordstar 1512, Word Junior and many more applications.

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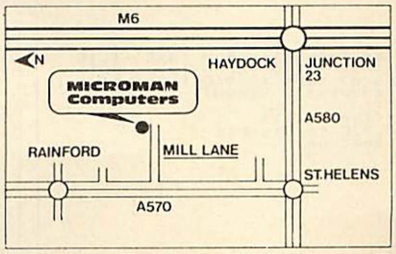
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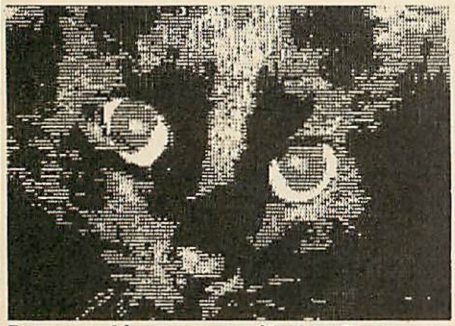
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ROMS

ACORN USER OFFERS

User Dump – Acorn User's printer control ROM – £19.95



Dump graphics screens with User Dump

User Dump includes a ROM chip which plugs into any free sideways ROM socket on your BBC micro, and an easy-to-follow manual. With the *User Dump* ROM installed you'll have access to a wide range of commands to help you control your printer's facilities – all for just £19.95.

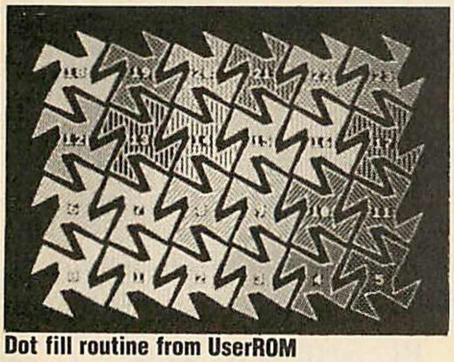
You will be able to dump any screen image in any display mode by entering a single command – either as a line of your program or alternatively by typing in direct from the keyboard. *User Dump* will also give a perfect dump while a machine code program is running.

This versatile ROM will work with all the popular dot-matrix printers, including all those with single and double density bit-image graphics.

Send an A4 SAE to Seran at Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF, for more details.

Order form on page 136.

User ROM – Acorn User on a chip only £19.95



Dot fill routine from UserROM

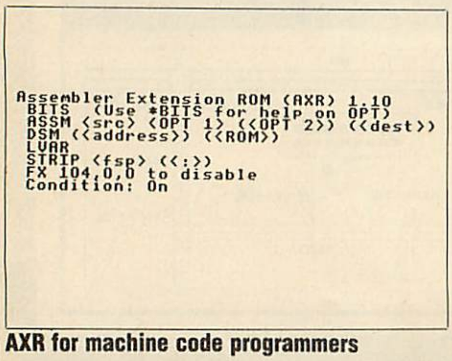
The *Acorn User UserROM* brings the best of *Acorn User* into your micro. Put together by our technical editor, Bruce Smith, this 8k ROM chip is packed with your favourite *Acorn User* routines. Simply plug the ROM chip into a sideways ROM socket and all the routines are instantly accessible via easy-to-use *commands – what could be simpler?

Routines include the popular colour fill and dot fill routines, bad program recovery, variable lister, function key lister, a graphics compiler, a circle drawing routine, sound compiler, plus lots, lots more!

Included with *UserROM* is a 22-page manual which explains how to get the most from your *UserROM*, and you'll find many demonstration programs showing how to use the new commands.

Full details available by sending an A4 SAE to Seran, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF.

Acorn User Assembler Extension ROM just £19.95!



AXR for machine code programmers

The AXR ROM is aimed at the machine code programmer. It adds a variety of assembly options and commands to the Basic assembler, including:

- New options controlled via OPT
- Assemble from disc or memory
- Assemble to disc or memory
- Branch to jump
- Enhanced error checking and reporting

The AXR also adds several new pseudo op codes to the assembler these are: ORG – sets assembly origin, DST – specify destination, DFR – define real numbers, DFX – define byte, word, double word, SWR – send assembly to sideways RAM.

The AXR also allows full Basic expression evaluation, the use of binary numbers (eg, %01100110). A disassembler is included, and all the 65CO2 instructions can be used (including BBR,SWB etc.). The ROM is compatible with both Basic 1, 2, and Master.

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PROGRAM LISTINGS

ACORN USER OFFERS

Monster monthly listings on cassette and disc



Phil Wilkes' monster, this month's bonus

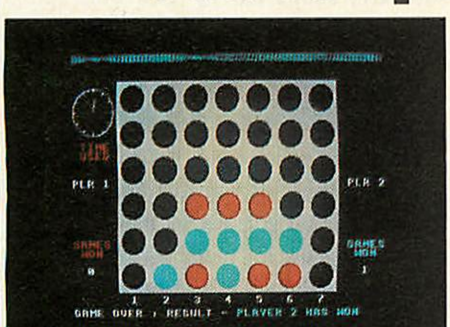
This month you too can join the ranks of the famous using David Lawrence's excellent, easy-to-use program music Editor. With it, you'll be able to compose and play your own masterpieces, and experiment with those written by your favourite artists. Plus there's a musical special by Bob Cornford-Wood.

Meanwhile David Atherton shows you how to use trackerballs, mice and joysticks with the Master Compact, in your own programs. John Knight helps out all *ViewSheet* users with a guide to printing spread sheets sideways on your printer.

All the programs in this issue are on cassette for the BBC and Electron and 5.25in disc. This month we have included a Monster graphics bonus, so don't miss out, send off for your disc or cassette now using the order form on page 135.

In exceptional circumstances please note we reserve the right to alter the contents.

Monthly program subscriptions on disc and cassette



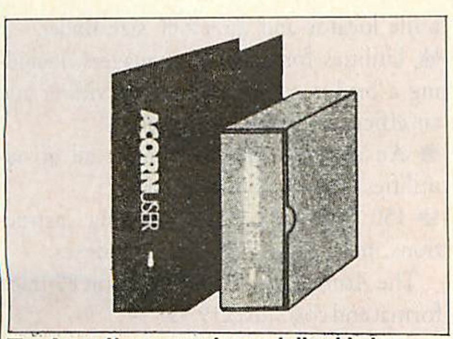
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Save yourself the trouble of ordering your disc or cassette listings each month and take out a subscription. We'll send you our great *Games Compendium* cassette when you apply for a cassette subscription – worth £3.95, or you may prefer to try us out for six months, which will cost you £20, a saving of over £3. These offers are only open to UK subscribers, not overseas.

New *Acorn User* monthly disc subscribers (in the UK) are entitled to receive one of our smart grey cloth disc binders in its own sturdy slip case – normally priced at £9.95. So you'll be able to keep your monthly discs in safety. If you prefer, you may subscribe at the six month discounted price of £30 – a saving of over £5.

Whichever you choose, you won't regret investing in our monthly listings, they'll provide you with useful utilities, graphic abilities, entertainment and much more throughout the year.

Vastly reduced disc binders £6.95



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This unbeatable offer must end soon! Save yourself £3 and buy the *Acorn User* disc binder now. The best way to care for your monthly discs.

The binder is made of superb quality grey cloth and comes with its own highly protective slip case. The binder has a huge capacity of 30mm, so it will comfortably hold all your monthly discs for a year. Our disc binder is already filled with six trans parent inserts, which hold two 5.25in discs.

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Our smart red magazine binder features a wide spine with the capacity to hold 12 full issues of *Acorn User* which are held in palce by metal strips.

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ACORN USER OFFERS

Disc problems? The Disc Help Disc will sort them out for £6.95



The *Disc Help Disc's* menu page

Have you just bought a disc interface or disc drive but the jargon has left you perplexed and puzzled?

Do you simply want to know all about discs and how to use your disc filing system ROM to its full potential?

Acorn User has the answer with the *Disc Help Disc*. It contains all you need to know about discs on a disc. Simply insert it into your disc drive and all the information you will ever need will be at your fingertips.

Everything you ever wanted to know about file maintenance is covered, and help is given on the transfer of Basic programs from cassette to disc.

A simulated disc filing system helps you practice using commands. You can even test your progress with the question and answer tutorial at the end of each section.

The disc is available in 80-track format only. Sort out your problems now using the order form on page 136.

Make learning easy with our Education Disc – at £7.95



The *Education Disc* menu page

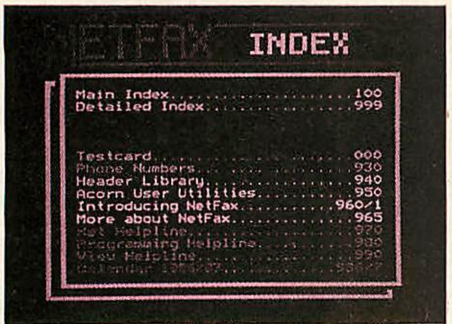
The *Education Disc* contains programs drawn from *Acorn User* magazine.

Eco-Fax is a sophisticated viewdata-type database for use on Econet systems, and comes with its own versatile frame editor. There is a colourful version of *Turtle Logo*; a program which shows equations as graphs; and a music writing program which allows you to edit tunes.

Graphics are a strong feature of the collection, including the *Easyplot* drawing software, supported by two other programs which use *Easyplot* screens as an electronic noticeboard or in place of an overhead projector. A bulletin board displays messages in scrolling characters.

There are routines to use in your own Basic programs – screen dumps, a machine code utility and graphics plotting and drawing commands in mode 7. The disc is available in 40 track format only, but can be copied to an 80 track disc.

Trouble free networking with our Utilities Disc only £19.95



Bring teletext information to networks

The *Acorn User Network Utility Disc* is the logical addition to your network, combining a wide range of invaluable routines with a sophisticated, yet easy-to-use teletext information system. The disc features:

- NetFax – our hybrid information system, provides thousands of pages of information which may be read without affecting any text or program in memory. It features an advanced teletext editor.
- Utilities for all network users, including a file locator and directory size finder.
- Utilities for network managers, including a bridge-compatible screen viewer and an efficient 'notify-all' facility.
- An auto-installer to transfer all of our utilities to your net painlessly.
- 150 NetFax pages, including instructions, help pages and sample indexes.

The *Acorn User Utility Disc* is in 80-track format and costs just £19.95.

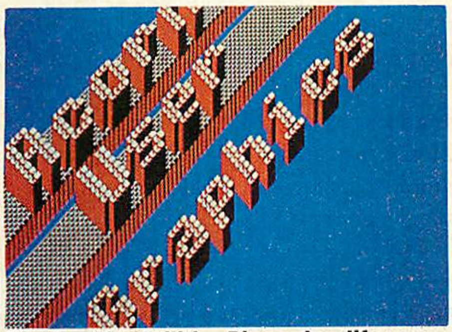
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Graphics Utilities Disc a bargain at £7.95



The *Graphics Utilities Disc* makes life easy

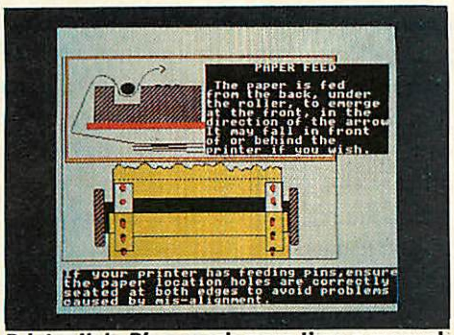
The *Acorn User Graphics Utilities Disc* contains four sections.

Sixteen machine code routines enable you to manipulate blocks of graphics. Rotation and reflection utilities are included, together with a screen compressor/expander, a colour flood-fill routine and three screen-mode conversion commands.

The Basic procedure library includes routines to produce multi-height, proportional and justified text as well as a procedure for 'drop-shadow' boxes. All of the procedures can be readily used in your own programs.

An advanced teletext screen editor gives you point-plotting and line-drawing, rubber-banding and even a flood-fill. In addition, full text facilities including all the mode 7 control codes are available. The program is easy to use with detailed help screens and has been written in 100 per cent machine-code for speed.

Need some advice on printers? Try our Printer Help Disc only £7.95



***Printer Help Disc:* much more than a manual**

Written by Benjamin Rietti, the programs and tutorials on this disc will help you to understand your printer's facilities.

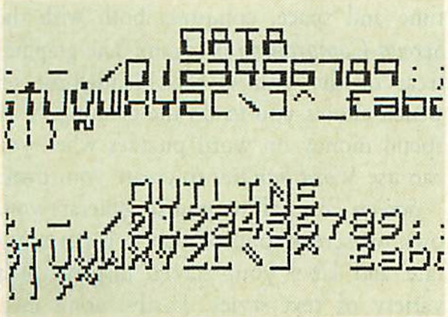
Printer manuals often don't fully cover the needs of Master and BBC micro series owners – our *Printer Help Disc* will! It includes what to look for in a printer, controlling type styles, using *Wordwise* and *View*, screen images, printer care, an ASCII standard codes table plus how to print £ signs, clear diagrams illustrating various stages of printer use and a program to display type styles. The *Printer Help Disc* will help you solve problems.

The disc is available in 40 and 80 track format, and is compatible with the BBC models B, B+ and Master 128.

For more printer compatibility details please send a stamped addressed envelope to Seran, Redwood Publishing 141-143 Drury Lane, London WC2B 5TF.

Order form on page 136.

Acorn User's Sideways RAM Utilities Disc £9.95



Fonts from the *Sideways RAM Utilities Disc*

What could be more helpful than our new *Sideways RAM Utilities Disc*?

Available in 40 track format with a transfer program for 80 track users, the disc includes:

- RamPad – an electronic notepad you can use at any time. Simply press a key for your computer's answer to the notebook and pencil.
- On-screen fonts – a variety of print styles available in all graphics modes.
- *HLP ROM – add your own help text to call up when you're really stuck.
- Standard ROM header – a sideways ROM header you can use as a starting point when writing your own ROMs.

Many more utilities – including *RLOOK to examine the contents of your ROM's and sideways RAM images. The disc is great value at just £9.95.

Order your *Sideways RAM Utility Disc* using the form on page 136.

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ACORN USER OFFERS

Gorgeous graphics screens at special prices



Dallas captured on the *Gallery Collection*

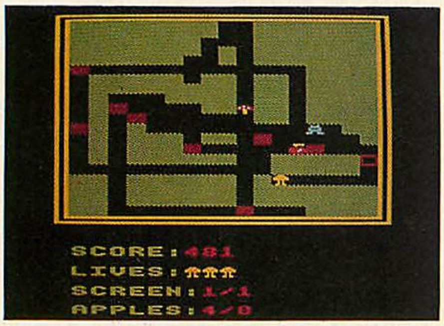
The *Gallery* disc and *Gallery Collection* disc have proved to be so popular with you that we've decided to offer you the chance to buy them both at the price of £11.95. Due to overwhelming demand we've extended the offer to the end of April.

The *Gallery* disc features an automatic scrolling display of over 20 stunning graphic screens. What's more, the disc gives you the chance to create your own screens with *Super Painter* and *Pixel Editor*. Screens include Spiderman, a Coke can, robotic brilliance and many others.

The *Gallery Collection* presented in the same way as the *Gallery* disc, contains over 25 screens, including the Dallas Compendium, a picture of earth from space and super cartoons.

The special offer price applies to the 40 and 80 track discs in 5.25in format. The *Gallery* disc and *Gallery Collection* discs are now available in 3.5in format.

Games galore at only £3.95 on our Games Compendium cassette



Shuggy's Garden on the *Games Compendium*

For all games fans using the BBC, Electron and Master we have put together on one cassette all the best games published in *Acorn User* over the last two years.

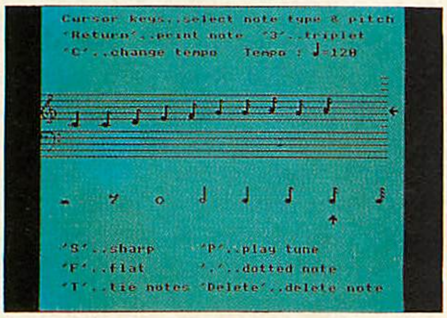
Included on the cassette is David Acton's blockbusting *Spectramania* and the popular *Quadline* – beat your micro and be the first to get four in a row.

Try guiding Shuggy round his garden collecting apples, but remember to avoid the ravenous monster! You can puzzle over *Puzzle*, and be amazed by *3-D Maze*. Or if setting depth charges and destroying submarines is more your style, go to sea with *Run Silent, Run Deep*. You can even try to work out the mysteries of the *Acorn User* office – enjoy yourself!

For the really adventurous players there is Rob Anderson's truly different *Adventure* game.

This exciting cassette is easily transferred to disc and costs only £3.95.

Acorn User Finest Favourites cassette – just £3.95



Tunemaker: an *Acorn User* favourite

For only £3.95 you can have this superb cassette which contains some of the best programs published in *Acorn User* since 1985. It will work on the BBC, Master and Electron micros.

Budding Beethovens can edit their own masterpieces with *Tunemaker* and play them back. Or you can add new commands, written in Basic, with Character Dumping and Basic Extensions.

Graphics screens can take up a lot of time and space, compress both with the *Screen Compression* program. The graphics treat of the year is the Mandelbrot set which allows you to do the creating. Why spend money on word puzzles when you can use *Word Squares* to create your own?

Screen Fonts allow you to generate your own on-screen fonts so that you can annotate and label your screen displays in a variety of text styles. Lastly, don't miss captivating curves with *Motion*!

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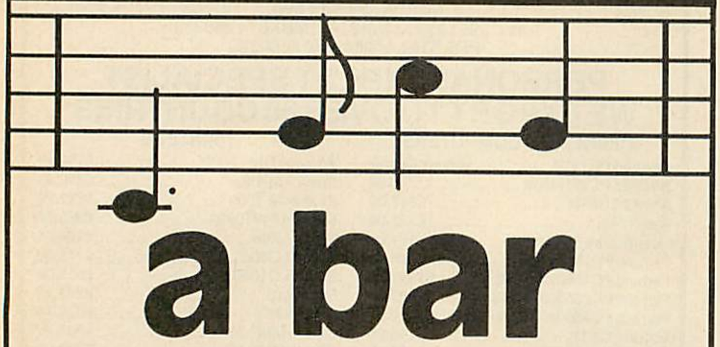
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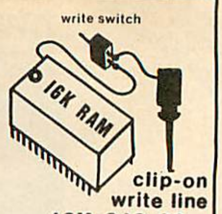
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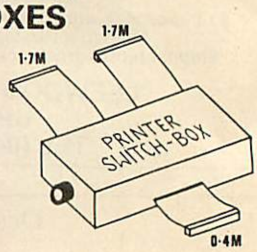


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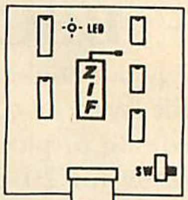
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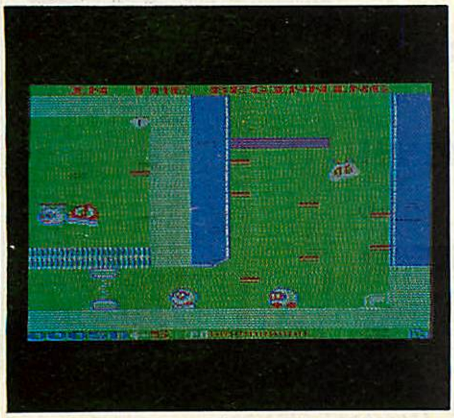
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REVIEWS

GAMES

SPOT THE DIFFERENCE



The Last of the Free; ASL; Electron/ BBC B/Master cassette £7.95. Quest for Freedom; IJK; Electron cassette £1.99.

Quest for Freedom, an Electron-only game, bears a remarkable resemblance to ASL's *Last of the Free*, which is available for both the Electron and the BBC micro, and was reviewed in February's *Acorn User*.

IJK claims to have bought the game from its author, Peter Scott, who later offered it to ASL, who, apparently unaware of IJK's involvement, then released its own version. Ian Sinclair, a director of IJK, told me: 'Although we owned the copyright to *Quest for Freedom,* after talking to ASL we believed they published their program in good faith, and we decided to take no further action.'

So, which version would I recommend? Superficially, IJK's game appears to have more going for it, since it is only a quarter of the price of the ASL version. But although the characters and scenes are almost identical, the ASL version is a far more balanced and playable game, with enough easy problems to get you going before the nastiness starts, and a significantly better 'feel'.

Quest for Freedom, then, offers a lot of game for £1.99, but remember it takes more perseverence to get into than *Last of the Free*. And one final word of warning – the publishers don't tell you, but you'll need to disable your Plus One before playing either version. If you're unsure how to do this, see Martin Phillips' Hints and Tips in the October 1986 issue of *Acorn User*.

Bernard Emblem

GOAL OUT OF CONTROL

Goal; Tynesoft; Electron/BBC B/B+/ Master cassette £6.95; BBC B/B+/ Master disc £8.95; Compact 3.5in disc £9.95

These double-sided tapes are a great idea, but why are so many of them incorrectly labelled? Time and energy could be saved if just a little thought was given to file names, for example using 'Elkload' or 'Beebload' instead of 'Loader'.

Goal features a view of the section of the pitch currently containing the ball – either the goal mouth or the centre of the pitch – and involves a match between Liverpool and Tranmere Rovers. Guess which team I was attempting to control!

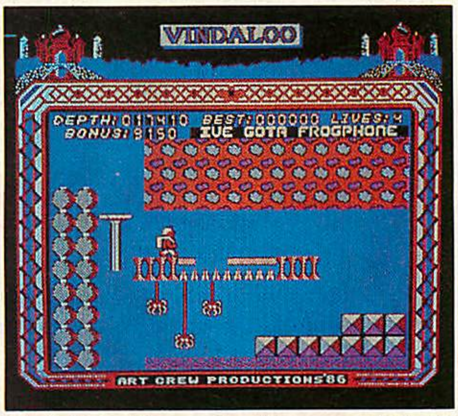
Although the game lacks joystick control and a two-player mode, it is a fairly realistic simulation, offering goal kicks, throw-ins, balls which bounce back into play off the goal post, and more. Play lasts for a token 90 minutes – in reality 30 minutes – and although there's a half time whistle, the teams don't change ends. This is a pity, as it allows Liverpool to kick towards the Kop for the whole match. A novel educational feature is that the scores are displayed in hexadecimal notation, which helps keep the tally down.

The machine emits a helpful beep when Tranmere make contact with the ball, but also insists on a dreadful and interminable congratulatory tune every time Liverpool score. I can only advise you to keep your thumb on the space bar throughout. It stops the music, but allows the beeps.

I could forgive this game its many minor shortcomings if it wasn't for a fundamental flaw: it's just too difficult for beginners. It claims to adjust its skill level during the game depending on the current state of play, but no-one I know would play it twice. I persevered out of a sense of duty, but never scored a single goal.

Bernard Emblem

CURRY IN A HURRY



Vindaloo; Tynesoft; Electron/BBC B/ B+/Master cassette £7.95; BBC B/B+/ Master disc £9.95; Compact 3.5in disc £12.95.

Raj, the proprietor of an Indian restaurant, has unfortunately eaten too much of his own wares. This has resulted in him needing to reach his loo rather urgently.

He has, however, got a long way to go since his loo is somewhere deep in his cellar. Thus to get there he must first make his way through all of the rooms in his path. Each of these rooms contain a number of objects which must be avoided if he is going to make it in time. Snakes, heads, skulls and bouncing balls plus falling through floors are just some of the things which Raj must avoid.

You must guide Raj through all these rooms to the loo. The keys you use are the simplest I've seen in any game yet; just Z and X for left and right. This makes the game sound easy. Not so!

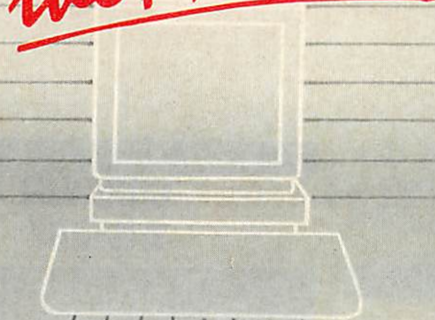
Each of the screens has a very imaginative title to it, relevent to the screen you are on, such as Skull Level 4.

The graphics are good but not brilliant. Movement is smooth (2 pixels at a time) and colour is well used. The sound is not superb either, but bearable.

The plot and action have a very original flavour (ha ha) and are well supported by the quality of the game itself. I would say it would make an interesting addition to anyone's library.

Gavin Gillings

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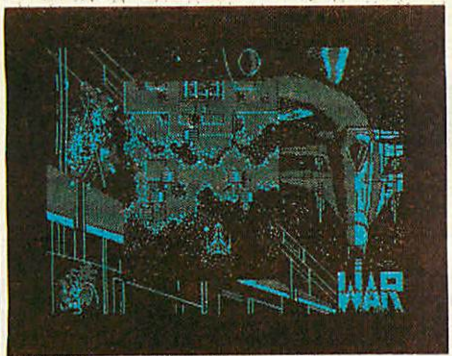
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GAMES

THE GAMES PAGE

David Lawrence with his round up of the games scene and the high score table

Yet another quiet month. In fact, I have only received three new games, but these are certainly worth a mention before I let the reviewers out of their cages. If you remember Rob Miller's review of *Psycastria* in February's issue, you will probably recall his main criticism was the small size of the screen. But that record has now been well and truly broken! *W.A.R.* (even though it is spelt like that on the box, it doesn't seem to stand for anything) by



***W.A.R.*'s record-breaking small screen**

Martech has a playing area approximately three by four-inches (on a 14in monitor!). Funnily enough, the idea of the game is very similar to *Psycastria*. The graphics, though monochrome, are very good and scrolling is excellent. I'll send this one to Rob with a magnifying glass!

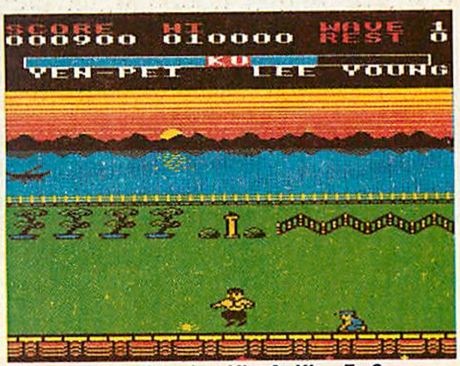
Daley Thomson's Supertest from Ocean is yet another Spectrum conversion of yet another sports simulation. You know, the sort of game that totally destroys your fingers and Z and X keys. There are eight events, each one giving your physical ability a gruelling test. Nothing special, but the variety of events should mean that you won't get bored after half an hour.

Finally, Imagine have come up with a sequel for their popular combat game *Yie-Ar Kung Fu*, called what else but *Yie-Ar Kung Fu 2*. How original. The game is very similar to number one, but with better background graphics and more stages and challenges. Peter Johnson, author of *Impossible Mission* and many other of the Commodore 64 conversions, has certainly come up with another addictive winner.

The most common noise in the *AU* offices at the moment is that little tinkly tune at the start of *Repton 3*. In a concerted effort we have finished most of the screens and have had fun trying out the bugs that people have pointed out to us. It is possible to change mode when entering a password (with CTRL-V); screen E in toccata is impossible to do if you use a password (ie, without doing screen D first). This only occurs in very early issues of the game as the fungus in screen E starts growing before you start the screen! If your copy does this, send it back to Superior who will send you a replacement. Finally, try finishing a screen except for defusing the timebomb, then move onto the timebomb and just before the screen clears, press Return (for your status), then press Space to return to the game. You will be back on the screen but with no timebomb! We occasionally appear in the middle of a wall, but suspect this is because of the Econet, so disable it first on a networked machine.

Acorn User high score table

GAME	SCORE	NAME
Alien 8	28 lost	F Brown
Android Attack	149,105	T Hedger
Arcadians	98,020	N Islam
Aviator	30,450	P Hopgood
Battletank	117,400	S. Gayler
Beach Head	166,000	N Brown
Castle Quest	3,020	F Brown
Centipede	2,000,010	C Cochrane
Chukkie Egg	32,002,640	N Wright
Commando	417,600	P Sharrock
Contraption	993,200	C Cochrane
Cybertron	715,960	N Islam
Eagle's Wing	112,700	R Schmidt
Exploding Fist (B)	397,100	C Parsons
Exploding Fist (E)	597,000	H Moore
Fortress	138,720	S Gayler
Frak!	20,000,200	P O'Malley
Free Fall	5,024	P Comber
Hopper	63,104	N Brown
JCB Digger	131,450	S Concoran
Karate Combat	132,250	A Beard
Killer Gorilla	836,475	S Concoran
Match Day	14–0	P Harvey
Meteors	498,500	P Ludgate
Missile	469,225	I Boffin
Monsters	283,000	S Concoran
Moonraider	642,125	S Concoran
Mr Ee!	1,286,850	C Cochrane
Overdrive (B)	380,640	S Gayler
Overdrive (E)	1,130,700	S James
Painter	203,690	N Shaw
Pengo	312,900	S Killworth
Planetoid	3,186,450	S Concoran
Pole Position	384,250	N Islam
Revs (Oulton Park)	1:17.9	C Cochrane
Rocket Raid	168,010	S Gayler
Snake	1,395	P Simpson
Snapper	2,005,120	M P Jarman
Space Adventure	4,890	M Bradshaw
Starship Command	8,420	I Boffin
Stryker's Run	16,100	P Sharrock
Thrust	1,054,450	T Simpson
Zalaga	29,329,420	S Gayler



The more challenging *Yie-Ar King Fu 2*

David Downes has sent in an interesting key sequence for Tynesoft's *Vindaloo*. Load the game as usual and pause it. Then press CTRL-f9, which will increase your number of lives to eight next time you die! This can be repeated as often as necessary. Nice one, Dave. If anybody else has found things like this, please send them in. There is, I hear, a cheat mode in *Psycastria*; if anybody has found it, I would be grateful. All I managed to find was that if you hold down I, L, T, D and N on the title screen the game 'presses' CTRL-Break!

I have had a number of requests for clues for *Dr Who* and the mindless (sorry) *Mines of Terror*. If anybody knows how to get anywhere in the game, or has drawn a map, please send it in.

The latest round-up of scores is printed above. Please keep your submissions coming in, as I haven't received many over the festive season. Don't forget to get two people to witness and sign your score and send in a screen photo if possible.

Next month is going to be a *Repton 2* special, so if you're still stuck amongst the skulls and spirits this will be for you.

HARDWARE

SPEAK TO ME

David Spencer examines the R & D speech recognition system, Micro-Voice

For many years people have dreamed of computers which they could talk to, and which would talk back to them. Human speech is however a very complicated process, and while we have seen a proliferation of speech synthesis techniques for the BBC micro in the past couple of years, the opposite process, speech recognition, has largely been ignored.

The Micro-Voice from R&D Speech Technology goes a long way towards filling this gap. Micro-Voice, a small unit, costing £149 plus VAT, is a complete speech recognition and high quality synthesis system for the BBC micro.

The main unit is a small black box about four inches by two inches and six inches deep. It is supplied with cables attached, along with a microphone complete with stand, a sideways ROM chip for the micro, a demonstration disc and a manual. This last item is rather thin (11 pages), but does describe the commands available quite well, with program fragments to illustrate their use. Sadly, no technical information is included, but there is a user survey to fill in and send back.

To get Micro-Voice running involves installing the ROM, connecting the device to the computer and plugging in the microphone. The ROM can be plugged into any sideways ROM socket, and people who don't feel confident can have this done by returning their computer to R&D with a cheque for £5 plus postage. The actual voice recognition unit is plugged into the 1MHz bus and the auxiliary power connector under the computer (the one used for some disc drives). If you have something plugged into the power socket this can now be plugged into the back of the Micro-Voice. If you are using the 1MHz bus, for example for a hard disc or a teletext adapter, you will need to purchase a special cable allowing two peripherals to be plugged into the bus. The microphone is plugged into the left-hand jack socket on the front of the Micro-Voice.

Also on the front panel is another jack socket for a headset which can be purchased from R&D, a red LED (light emitting diode) which indicates the system is listening, and a chrome volume control.



The Micro-Voice, very good performance if you follow the recommendations in the manual

PHOTOGRAPH BY JAMES JOHNSON

On powering up the computer, you get a nasty surprise. On a Master 128 the value of PAGE is pushed up to &1A00, meaning that the speech ROM has claimed 3k of workspace. On a BBC model B with an advanced disc filing system and Econet, PAGE is at &2500. Therefore long programs in high resolution modes are impossible. It is a pity that the ROM isn't written to make use of the hidden RAM on the Master computers.

Before the system will recognise anything it must programmed with 10 words using the *TRAIN command. This command takes two parameters, the first a number between one and 10 which represents the word being taught, known as the template number, and a second number which when zero will start a new definition, and when non-zero will average the new definition with the old one for that word. The instructions recommend that each template is trained twice, first without averaging, and then with. It is possible to take more than two samples, but if too many are used it will deteriorate rather than improve the stored template. When the *TRAIN command is executed the LED on Micro-Voice lights, and after waiting about a second to allow background noise to be filtered out the word should be spoken. The software detects when the word is finished.

Once the 10 word templates have been programmed the system is ready to listen for words. This is simply done with the *LISTEN command which lights the LED and waits for a word to be spoken. The command exits when a word is detected,

and the number of the word matched can be read from location &70. Location &71 contains a matching correlation between zero and 127. A value of zero means that the word was matched perfectly, while a value of 127 means that the matched word is only probably correct.

Also included in the ROM are the commands *RLOAD and *RSAVE which can load and save a set of 10 templates, which allows libraries of words to be built up and incorporated into your own programs. The final command is *TALK which speaks a word either from ROM or RAM, the word being selected by its address in memory. R&D Technology will code the words on an audio cassette to the LPC format at a cost of £1 per word, which seems rather on the expensive side.

For the technically minded the Micro-Voice uses a method of storage known as Linear Predictive Coding (LPC), which is the same technique used by the Acorn speech system for the BBC micro. This method uses certain properties of speech to cut down the information which needs to be stored. The software also includes Dynamic Time Warping, which sounds like something straight out of *Star Trek*.

The demonstration software is on a 40 track disc, and consists of a recognition and synthesis demonstration along with a version of the coloured pegs *Mastermind* game, with the colours being spoken. The recognition demo simply changes the screen colour at your spoken command, while the synthesis program says one sentence with excellent clarity.

In the advert for Micro-Voice the manufacturers suggest a list of applications ranging from adventure games to data logging, and controlling teletext. Personally I am a bit doubtful of the possible uses, but I'm sure that some people will find this an invaluable aid. As far as performance goes, the system is very good, especially if you follow the recommendations given in the manual, such as banishing the children from the room. But at over £150 I don't think that Micro-Voice should be bought just as a novelty.

Micro-Voice costs £149 plus VAT, optional headset £25 plus VAT and word programming £1 per word. Available from R&D Speech Technology, Waterside House, Pondershaarden, Penryn, Cornwall TR10 8AR.

FOOLPROOF ADVENTURE

Your Adventure; Learning and Training Systems Ltd, MACE.

Your Adventure is an educational game package,suitable for six to 13 year olds, according to the blurb. It is also suitable for teachers, I found – but maybe I'm a six-year-old at heart!

Two sample adventure games are included on the single 40-track disc, plus some extra programs. The adventures are very short (as you would imagine they have to be for the youngest pupils), but there is an attractive and attention-grabbing mode 7 graphics screen representing the map of the adventure. As the game is played, a symbol representing the adventurer jumps around this screen, visiting various locations, but not in any sequence.

At each location a standard description is given, and then a problem is presented. This takes the form of a riddle, general knowledge question, or puzzle expressed in words. The child has to answer correctly to be awarded one unit of treasure, can be given a hint if his or her first answer is wrong, or can be told the answer. Usually, however, the child is left hanging if he doesn't know the answer – most annoying, I found, as I couldn't guess some of them myself. No doubt the average six-year-old would find them a walk-over.

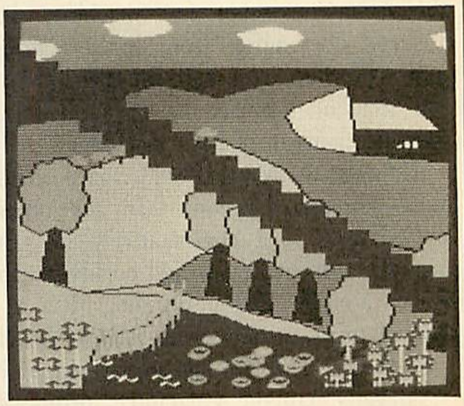
The adventurer ends up at the cave where all the treasure earned is collected, and must answer one final super-riddle to get at the gold (represented merely by pound symbols). It's all very mercenary, but no doubt fits in with the present Government's long-term strategy for primary education.

Incidentally, there are very few bugs in the program, beyond the spelling on the pack; I found only one. All programs load first time, and although the adventures are a bit slow, nothing goes obviously wrong.

The real point of *Your Adventure*, however, is still to come. This is the Specify program – an editor which allows you to change the riddles in the adventure, and to leave out some of the locations if you wish. The extent to which you can tailor the adventure is strictly limited, though. The map always remains the same, and the locations the child can visit are therefore fixed in character. For this reason older children will quickly tire of playing the games, and the intention is certainly to move them on to creating their own 'adventures' using the editor. The editor itself is very straightforward, almost foolproof.

All in all, *Your Adventure* is an enjoyable package that should be given a try. **Peter Voke**

TREASURE TROVE



Box of Treasures; 4 mation; BBC B/B+/ Masters/Compact/3.5in and 5.25in disc £26.45

This represents a departure from traditional topic-based software. If your school is one where all the computers are in their own special room, and programs are used in complete isolation, you're probably going to consider this package rather expensive. Techno-freaks and machine-heads please note that there is more in the box than a couple of discs.

As a resource pack this set of material takes some beating. It comprises two discs bearing nine separate programs, an audio tape containing three stories, six extensive and well-produced booklets, five help cards, a cut-out model, word cards and various labels.

The whole project revolves around the concept of the Box as the central theme. How you go about interpreting this theme is entirely up to you, as there is no definite route, no plan of attack, only stimuli for both teachers and pupils alike.

Mike Matson et al, who have proved themselves masters of the topic pack with such delights as *Granny's Garden*, *Flowers of Crystal* and *Dragon World*, have surpassed themselves in this collection.

They are not aiming at the unenlightened teacher, however. Instead the writers are looking towards those adventurous souls who will transform their whole teaching environment into a world developed from their topic teaching. **Peter Voke**

HARDWARE

SLOGGING IT OUT

Bernard Emblem speeds up his Electron with a Slogger RAM board

Slogger's Master RAM board offers Electron micro users a solution to the two criticisms most commonly, if rather unfairly, levelled at their machines, that is their limited speed and memory. Though it is already a reasonably fast machine, the Electron does suffer from speed restrictions when compered with the BBC micro, and lack of memory has been a long standing criticism of both machines.

Although the Master RAM Board offers more dramatic solutions than any other add-on, and at a comparatively modest cost, Electron owners would be advised to think carefully before deciding that increased memory and speed will solve all their problems. Are things ever so simple?

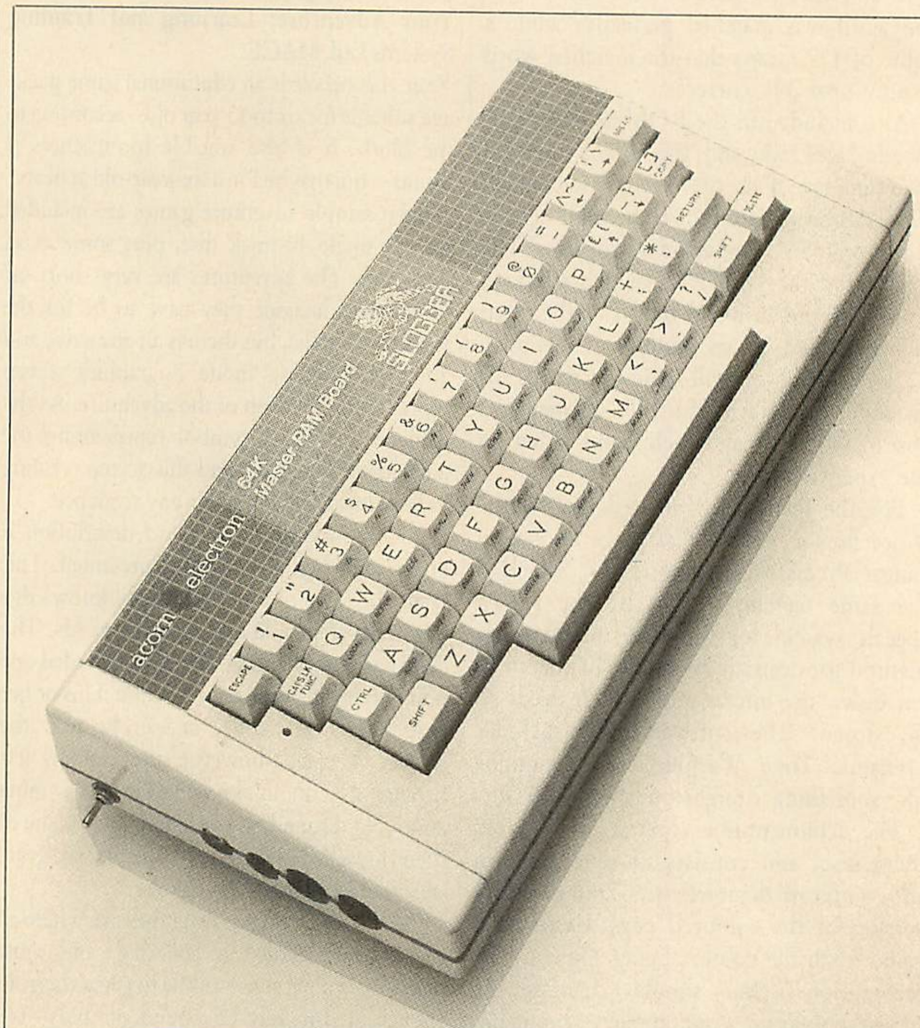
Slogger's 'Unique Guarantee' promises return of your micro within seven days of its receipt by Slogger. However, my machine was away for 15 days and it took a phone call before it was returned with its new switch rattling in the box.

The Master RAM comes on a small board containing a 16k ROM, programmed with a new machine operating system (MOS), which sits inside the micro, and automatically switches out the old Acorn MOS. It is connected to a flimsy switch on the side of the micro, which switches between three modes – Shadow, Turbo, and Normal. Let's examine those modes:

1) Shadow mode: In some modes, 20k of the Electron 32k RAM may be used just to handle the screen, leaving precious little left for programs.

The 'Shadow' principle, as used by Acorn themselves, sets aside some memory to deal with the screen (in this case, the Electron's original 32k RAM), and then provides extra memory (here 32k) to deal with programs. Though some memory is required by the operating system in any mode, this means that programs, whether in Basic or machine code, as well as text files when using ROM chip based databases or wordprocessors, can now be up to 28k long. What's more, they'll run faster.

Mathematicians may have realised that, with the original 32k of RAM handling up to 20k of screen display, that still leaves at least 12k unused. Slogger's inadequate user guide suggests that 'the user may wish to use this extra RAM as a printer buffer'. Nice idea, but how do we do it? 'See the section on Technical Information'. Not a great deal of help I'm afraid.



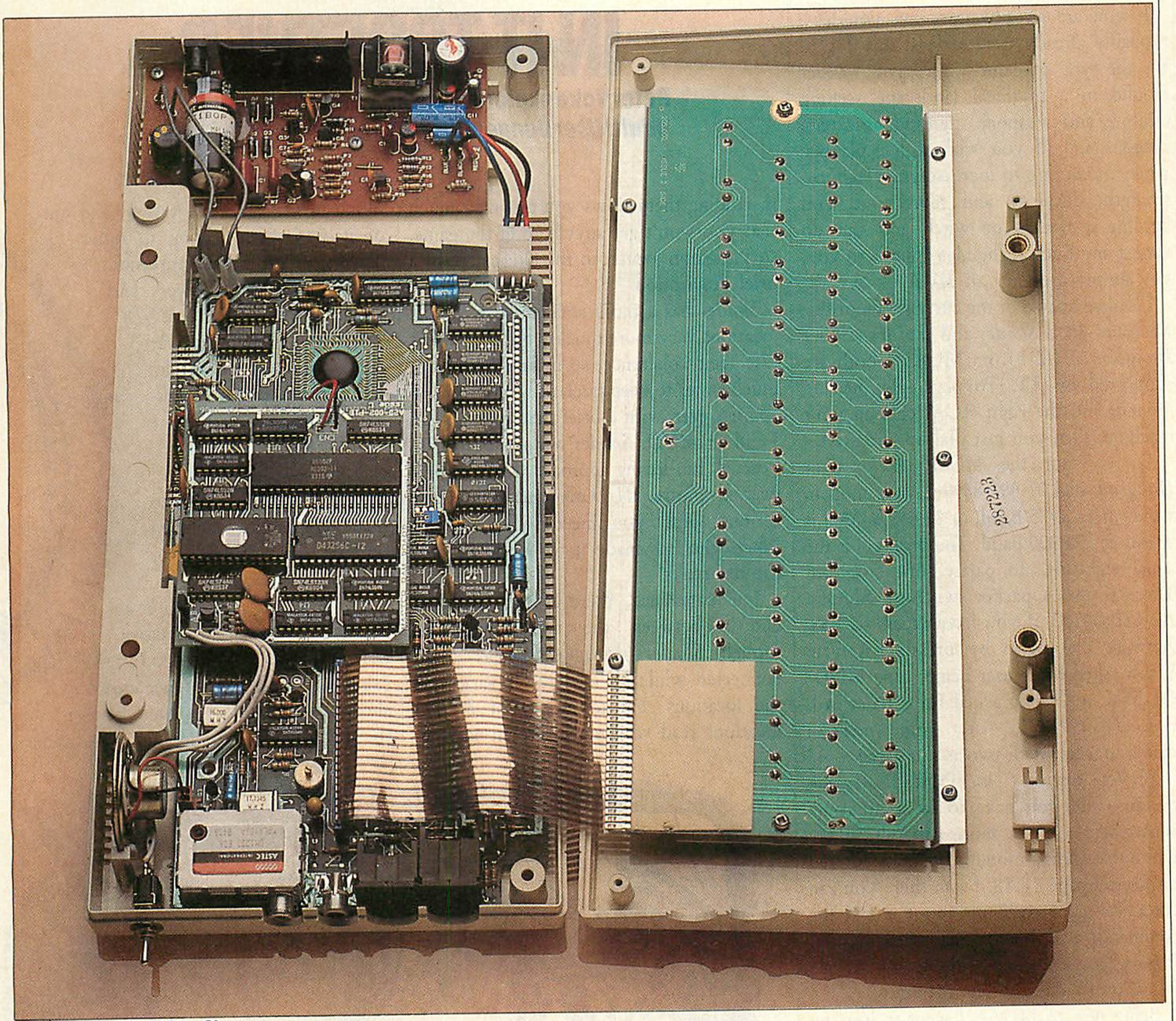
The only signs of the Slogger are the switch and stick-on label

PHOTOGRAPHS BY JAMES JOHNSON

I was pleased to find everything I typed in, all *Acorn User* software I tested, and all Acornsoft's 'Creative Graphics' programs running at BBC micro speed, with extra memory left for enhancements as required. This is a great boon for people who frequently use Electron programs on a BBC micro, and vice-versa.

2) Turbo mode: Games players will, however, quickly discover that very few commercial games will run successfully in Shadow mode, as most of them write directly to the screen, which has, in effect, moved address. Turbo mode was created for you. The Electron's memory remains unchanged, but the machine runs at roughly BBC micro speed. Slogger claims that the Electron will now run BBC micro games 'where speed was the limiting factor'. Most Electron owners with access to BBC B games will know this is a very limited promise, since very few model B games will run on the Electron.

Slogger quotes *Aviator* and *Strike Force Harrier* as two games which can now be played on the Electron, but I had very little success – two games I tried wouldn't run at all (*Noc-A-Bloc* and *Smash and Grab*), one which used to run slowly wouldn't load (*Wallaby*), and just one was brought up to par (*Chukkie Egg*). The plain truth is that,



The inner workings of the Slogger

with Electron games now outselling BBC micro versions, most high quality BBC micro games have an Electron version, with the two often on a back-to-back tape, so who needs BBC micro games?

Those who hope the Turbo will give their Electron games a new lease of life can also expect only limited success. Some games seem unaffected by the Turbo mode (Electron *Chukkie Egg*, *Frak*! and *Citadel*), some won't load in this mode (*Thunderstruck*, *Felix in the Factory* and *Last of the Free*), some are just that bit faster (*Star Striker*, *Repton 2* plus several adventure games), while some run ridiculously faster (*Hopper*, *Snapper*, *Overdrive* and *Mr Wiz*). The modest speed increases generally improve the games, particularly in the case of the adventures, where pictures are drawn very much quicker, and commands are interpreted a great deal faster.

For the games which run at Turbo speed, it's a matter of personal choice. High speed *Snapper*, for example, has gone down very well in our house, especially with Fred, our resident *Snapper* addict, but on the whole, I feel most arcade games reach impossible levels pretty quickly, with slow initial speeds being a function of the game design, rather than a reflection of the machine's poor processing speed.

3) Normal Mode: Here the Electron behaves as a standard machine, and will be used by me for most games, while I'll stay in Shadow for serious and home-made software, and use Turbo for adventure games and playing high speed *Snapper*.

The Slogger Master RAM Board delivers the extra speed and memory its publicity promises, but has the drawback of non-standard facilities.

If you need more memory for writing programs to use on your own machine, or for text files, or want to see your programs run at BBC micro speed, you may consider this a sound investment, but if your interest is in games, I'd think carefully before buying – I suspect the novelty of Turbo *Snapper* will soon wear off.

The Slogger Master RAM board costs £64.95 inclusive of VAT installed by Slogger or as a kit without the 6502 processor for £54.95. Contact Slogger Ltd, 107 Richmond Rd, Gillingham, Kent ME7 1BR

GAMES

IN IT TOGETHER

Peter Voke explores two multi user adventures, The *Multi User Dungeon* (*MUD*) and Micronet's *Shades*

One of the latest games trends to absorb home computer users is the multi user adventure (MUA).

If you are an adventure fan you have probably already tried at least one MUA. It's the type of game where you wander around in a mythical landscape seeking treasure and weapons, fighting monsters, dragons and, if you wish, other players, while attempting to increase your stamina, strength, dexterity and score until you become a wizard or witch and can do almost anything. If the idea appeals to you, you simply must try an MUA.

I looked at two of the current favourites: Micronet 800's *Shades* and the *Multi User Dungeon (MUD)* from MUSE – both are supported by BT. To play, you need a modem and the right ROM chip in your machine; then you just dial up and start.

To try out the MUSE *Multi User Dungeon*, dial 01-998 8899 if your modem works at 1200/75 baud, or 01-997 9433 if it works at 300/300 baud. The protocol is the usual eight-bit, no parity, one stop bit. There is also a packet switching address, A21880100300, if you have access to PSS. Activate the log-in by pressing Return. When asked for a user name, type MUD-GUEST, and when asked for a password, type PROSPECT. After some news a menu appears; item two is the game.

Shades operates in Prestel off-peak periods, and you have to be a Micronet subscriber, so it is more difficult to try without spending money. *Shades* is entered on Prestel page 81188. From there you can enter the game, read up about it and the commands available, or mail other players. Playing costs 1.6p per minute, so 10 minutes' trial would be less than 20p.

Being new to MUAs, I went in looking for the same things I admire in ordinary single user adventures: things like atmosphere, coherence, good game structure, and so on. There is a great deal more to an MUA than to a traditional adventure, and MUAs really have to be judged on different grounds.

But, let's take atmosphere first: MUSE's *MUD* is definitely better than *Shades* here, although atmosphere is difficult to define. If you thought Acornsoft's *Sphinx Adventure* was as good as their *Gateway to Karos*, for instance, then you certainly have no feel at all for atmosphere! *MUD* has a cold, Nordic feel about it, with gigantic mountains towering up to the south and east of the land. Part of *MUD's* strength is the quality of the descriptions of each location, which are excellent. The trouble is, reading them slows you down so much that you won't get anywhere in the game, so you soon switch to the alternative of a brief description.

Shades has a more amateurish feel. The locations vary more quickly but they don't lose their coherence, so in fact I found it much easier to keep track of where I was in *Shades*, even with a brief description, than I did in *MUD*. *Shades* has a more light-hearted, fun-loving approach. It is a teddy-bear adventure. *MUD* manages to be rather serious, until you meet some practical joker who has made it to Warlock: then the fun starts!

For coherence, there is not much to choose between the two adventures, though *Shades* manages to stay well-connected while having greater variety in the locations. Far too many of *MUD's* locations read very much like an adjacent one, which must surely be a fault.

On the game structure, *Shades* is better for the less experienced adventurer, who wants plenty of fun at the lower levels.

For the novice beginner, *MUD* can be frustrating. I spent all my reviewing time as a novice (naturally enough), though I am now well on the way to the next level. Much of my time in the game and out of it was spent talking to other players to get their impressions. To summarise, novices and guests don't much like *MUD*. They can't find any treasure, don't know what to do, and spend their time waiting for the next reset (more about resets below) or chatting to each other in the bar. Typical answers to my enquiries included phrases like 'bored' or 'where's all the T?'.

Shades is more exciting for a beginner. Maybe I got a particularly favourable impression because a kind-hearted enchantress showed me how to get over the river to the ruined city in my first game.

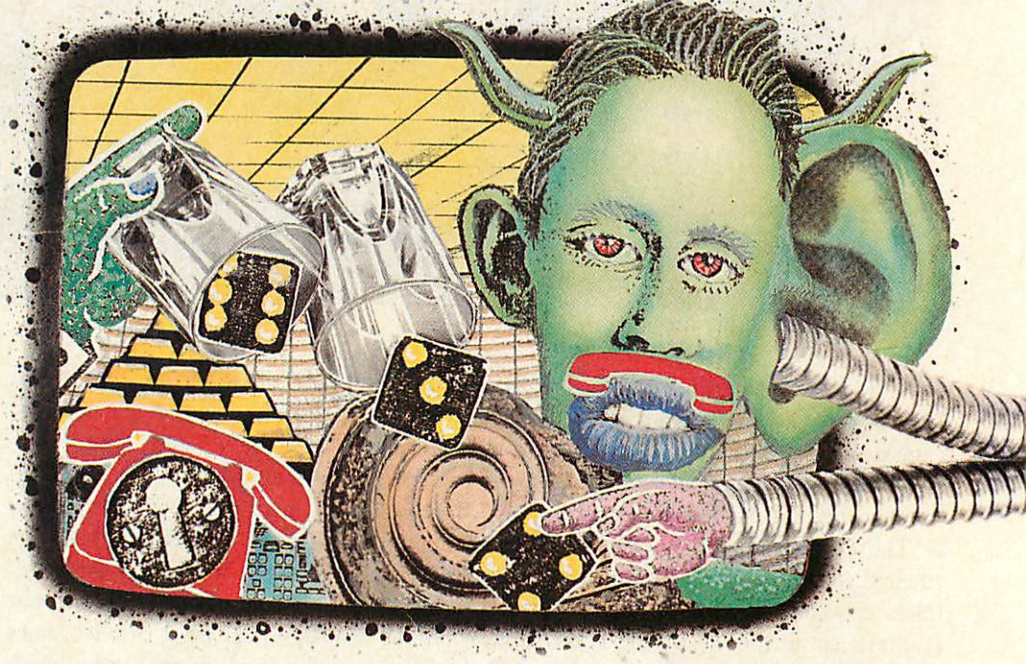


ILLUSTRATION BY SIMON FELL

This brings us to the real issue that makes MUAs so much better than traditional single-user adventures, but which also causes their problems: the other players. No hatchet-chucking dwarf controlled by pseudo-random numbers can be as original, intelligent, helpful, frustrating, useful, fun, maddening, competitive, friendly, or



dangerous as another human player. A multi user adventure is a million games, not one, because no session is ever the same as the last.

Remember that feeling in single user adventures when you were starting on the last run through, having finally understood why you actually needed the rusty nail from the quarry after all? You collect the nail, and then spend the next three hours running right through the adventure. Boring, because you have seen it all too many times before, but satisfying because you are so competent and you are about to solve the final ultimate puzzle.

That never happens in a multi-user adventure. Next time you log in, the nail won't be there because somebody else has it. This doesn't spoil an MUA because it is designed to have many puzzles than can be tackled simultaneously by many players: it has a tree structure instead of being linear. You have to be an opportunist, grab what there is going and make the most of it. You won't like MUAs if you are one of those arcade players studied by certain psychologists, who found refuge in video games because they could 'control them' but couldn't cope with the Big Game outside the arcade. An MUA has everything from a single user adventure and much, much more. The game is just a fake setting in which to interact with other people in a limited and (it is hoped) enjoyable way. You could say the same about every team sport, not to mention bridge, youth hostelling, pub crawls and Mediterranean cruises. Adventurers, in other words, have joined the rest of the human race and are doing it together. You can talk to other players, help them, follow them about, attack them, steal things from them, cast spells on them (if up to it) and even, in *MUD*, do daft things like tickle them.

But the other players are also the problem in MUAs. Not when they are bolshy or aggressive: that is part of the game. But because they are collecting treasures and weapons, killing gremlins and so on, the game 'runs down'. In *MUD*, treasures are dumped in a swamp to get points, while *Shades* has a much more original place to take your treasures which nevertheless still removes them from the action. As a result, after an hour or so, there is nothing much left to do.

To overcome this problem, both MUAs reset at regular intervals. A reset puts the game back into its original state, with the treasures, weapons and monsters in various more or less predictable locations. This is standard practice, but I'm afraid I don't like it. Resets are false, have nothing to do with the game, and are imposed from outside. They are the multi user equivalent of starting again.

There are two things wrong with resets. First, because everybody is restarting the adventure simultaneously, experienced players who know their way around mop up the useful items rapidly, leaving almost nothing for novices or guests to stumble on even five minutes later.

Shades is much better at coping with this than *MUD*, since there are eight games of *Shades* running on each Prestel computer simultaneously, with a limit of up to eight players in each game. There is also (I think) more accessible treasure in *Shades*, so you usually find something to collect.

MUD is definitely worse in this respect – hence the complaints about boredom, and mass exits from the game shortly before resets, with all players gathering to moan in the saloon bar! Second, at reset there is a mad rush to get back into the game (worse in *MUD* if there are more than eight players) which completely wrecks the atmosphere.

The *MUD* literature does tell you about these problems, but almost makes them out to be virtues, like the daft suggestion that crashes should be 'used to your advantage'. The fact that something like the reset rush hour has become a tradition does not make it a virtue; *Shades* is definitely better because the problem is not so bad.

These two MUAs are both first generation, based on the original Essex University *MUD*. The next generation of adventures will, or should, deal with the reset problem in a much more effective and subtle way, by a policy of continuous reset. The idea is that many common items needed by several players at the same time should be available in large numbers.

Other items, such as those crucial to solving the most difficult problems, there should be only one of, but should be reset continuously if the player does not make use of them. Such an item should be taken from the player and replaced in its original location if the player does not use it at all in any period of five minutes, does not use it for its intended purpose within half an hour of finding it, or disposes of it by dropping it down the volcano or into the sea, or if the player quits. The precise mechanism for resetting items should depend on the type of game.

Unfortunately such things are still in the future. Other aspects of both games are also not yet implemented, though planned. *MUD* has a large number of locations (there are many hundreds, about 40 per cent of which are underground), although MUSE says that it is constantly being extended and improved. The main thing that is missing is 'mobiles' – semi-intelligent entities controlled by the com-

SOFTWARE

A LA CARTE

***Menu Master*, says Benjamin Rietti, is worth more than its small cost**

puter. There are a few, but they aren't yet very good.

Shades has more impressive mobiles, but there are lots of indications of construction work in progress on the layout. You come to parts sealed off by mysterious grey walls with computer printout messages stuck to them – or more gruesome indications that somebody hasn't finished the programming on time. I found little of *Shades* underground, but so far I have explored only a fraction of the 16,000 rooms it has, or is intended to have. *Shades* has neat touches like the 'information cavern', close to where you enter the adventure, and there is an adventure chatline outside the adventure, in Micronet 800, that corresponds roughly to MUSE's saloon bar.

When you join *MUD* you get a lovely but not very detailed map of 'The Land', and a booklet telling you what you need to know to get started. The first location is odd, and unlike any other in *MUD*, so don't be put off by it. There is a little tripwire problem you have to solve to get out of it and into the game proper, but that should only take a moment to figure out.

Choosing between the two is difficult. If you already have a Micronet account, then *Shades* will be an obvious first choice. Almost everyone I spoke to in *MUD* played *Shades*, though the converse was not the case. If for some reason you have a modem but not a Prestel/Micronet account, then *MUD* could be cheaper (£1 to £2 per hour compared to 96p per hour on top of the annual £66 fee).

Calls to Prestel computers are always local calls, while the MUSE computer is in London and will only be local for you if you live in the right area. For me, calling from a home county, phone charges to *MUD* were more than three times the price of those to Prestel.

If you are new to multi-user adventures, go for *Shades*. You only pay for what you play, and access to Micronet is useful for many other things. Once you have mastered *Shades*, the dizzy heights of *MUD* Wizardhood still beckon.

To subscribe to MUD, write to MUSE at 6 Albermarle Way, London EC1V 4JB. Each hour's play on MUD cost £2, with reductions of up to 50 per cent for bulk purchase of credits. To subscribe, get your own Micronet account from Micronet 800 at 8 Herbal Hill, London EC1R 5EJ. A year's subscription is £66.

Menu Master is one of those rare programs whose value far exceeds its cost. It's a real asset to disc users, removing the nightmare of having to amend menus each time a new title is added to the catalogue, and contains a wealth of disc system routines.

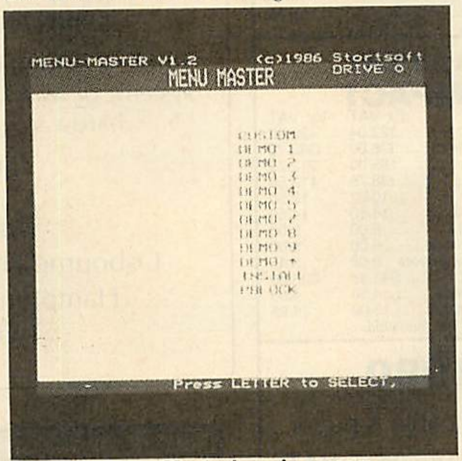


Figure 1. *Menu Master's* main screen

Menu Master is totally at home with the BBC B (OS 1.0 or later), B+ or Master, is compatible with the 6502 second processor, Acorn DFS, Watford's 62 file DFS, and ACP's Advanced 1770 DFS. The disc supplied is not protected, but each is coded with the purchaser's name and address.

The heart of the utility's automatic menu generation is held in the use of directory letters (see figure 1):

A for Basic programs which will simply be chained from the default page location.

B will run a Basic program which needs to be shifted down in memory.

D to load and list, in page mode, a program in Basic.

X which *RUNs a file.

Z as X, but with the neat trick that if the machine code needs to be run from disc filing system workspace, it will be *LOADed to PAGE, moved down, and the appropriate call made.

L *LOADs machine code.

E will *EXECute text.

T displays a spooled text file.

7 is used to display a mode 7 screen.

G for general loading of code.

The menu program works across however many drives you have, and a useful facility is the ability to give some positive information about any file in the menu: you may list the first line of a Basic program (eg, to see a useful REM statement), or even dump the first 256 bytes.

Pressing Tab at any stage of the menu's operation will give a printout of the information on screen.

Added to *Menu Master's* nuts and bolts operation are a number of frills. You can define certain paramaters which will affect the current disc. For instance, it is possible to specify whether or not the second processor is turned on or off from booting up, and to keep control of the ROM chips in your machine, turning some on or off as you require. Helpfully, if you stipulate a ROM's presence and *Menu Master* doesn't find it, it will try and *LOAD it from disc to sideways RAM – how much more help could you want?

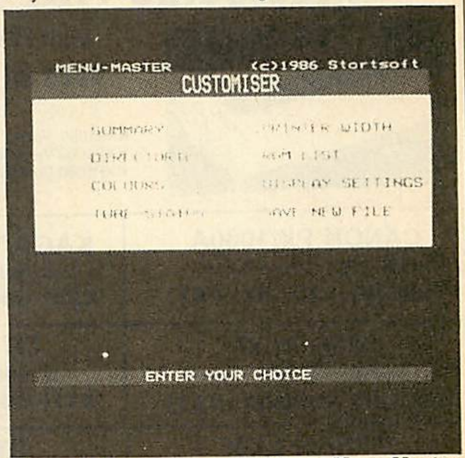


Figure 2. Programs available on *Menu Master*

The only snag with the program is that by its nature it takes up valuable space on each disc, so 40 track users beware.

Also you do need to learn good habits in assigning directory letters appropriate to your files. The manual, although more than adequate, reflects the budget price. But at £6.95 you get value and a program to save time and effort.

Menu Master costs £6.95 on disc from Stortsoft, 2 Hillfields, Chelmsford Road, Hatfield Heath, Bishops Stortford.

EPROMS, 8271

	Ex VAT	In VAT
1-9 27128 250nS	2.57	2.95
10+27128 250nS	2.30	2.65
1-9 2764 250nS	2.26	2.60
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Taxan KX1202 P39	91.30	105.00
Taxan KX1203 Amber	93.04	107.00
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Microvitec 1451 ms	223.48	257.00

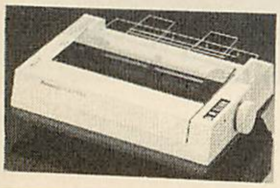
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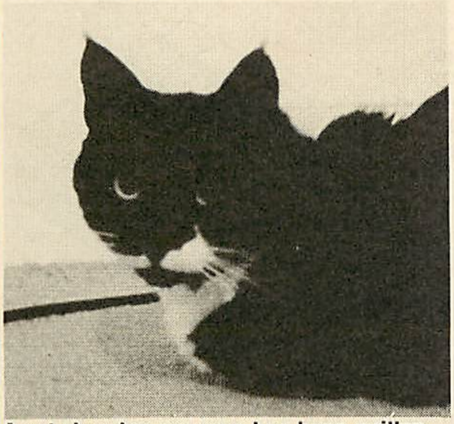
JACK OF ALL TRADES

Roger Carus surveys the uses of BBC micros in business, looking for new ideas

With so many BBC micros around – over a million of the whole range – the uses being made of them are enormously varied and many owners have thought up ideas to help them at work or play.

Some ingenious people have created small businesses around what started as a hobby. Recently I heard of a retired man in Surrey who is starting to market a collection of programs for use by churches, a mixture of record keeping software and games for church fêtes. And he is writing them all himself.

At the other extreme, large businesses have organised their office systems around the equipment. It is well known that the *Acorn User* editorial office itself and Redwood Publishing's other magazines are entirely built around BBC micro systems,



A cat-choosing program has been written

and it comes as something of a surprise to find that there is not a typewriter to be seen there. A network with printer servers covers the needs of all the 60-odd staff.

Occasional users

Between these extremes there are many experienced professional writers and journalists, including occasional ones like myself, who do their composition directly on the micro using a wordprocessor. Many students who learned the skill at school find their essays easier to improve and more legible when prepared in this way. There are the obvious school uses for marks, registers and timetables as well as staff lists and teaching aids. *Acorn User*'s own *Education Disc* is exceptionally useful; recently I visited Southgate Technical College and saw the directions for visitors on a screen above the reception desk using the *Eco-fax* Teletext Emulator which is ideal for the purpose and would be good value itself even if there were not so many other useful programs on the disc.

Small and large

I have identified many home-based small businesses, often in the microcomputing or related fields, which use them to keep all the records, while larger businesses find them good for stock control.

At various times I have used or seen advertised programs for bookmakers to settle their bets, for dentists to record appointments and keep fees, and farmers to monitor use of foodstuffs. I even tried using one of the systems to help with my entries for the football pools, but decided it was such hard work that I would use a random number generator and I'm still not a millionaire.

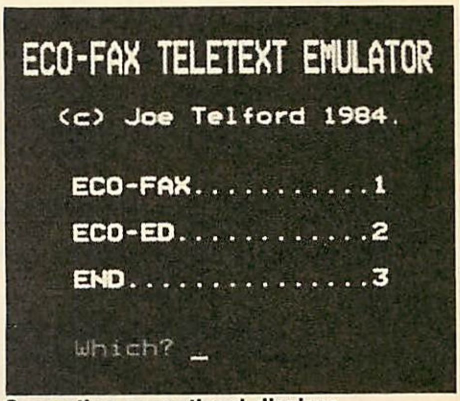
Research

Compared with such simple uses the research possibilities are enormous. When reviewing the University of Reading's *Instat* package for statistics, a list of users was attached and I was astonished to see the range of laboratories using a BBC micro for major research.

Most users I know make use of programs bought 'off the peg', but a few have written their own or adapted others. I did this myself with one designed to choose a pedigree cat. All you do is answer questions about its colour, shape and temperament and it tells you which of 28 varieties you should think about.

It is quite common for instruction manuals, and not only for computer-related products, to be kept on a wordprocessor which allows them to be updated quickly and easily.

By contrast, a few pieces of software have been written for special purposes,



Generating promotional displays

usually where someone with the necessary skills was faced with a problem at work and saw a solution using a computer – if the software existed. Peter Sandford's colour fill and shading routines published in *Acorn User*, for example, were developed for his work as a surveyor but can also be used at other levels.

Acorn User would like to hear from you if you have made use of the BBC micro in any way which might interest other readers and will report from time to time with a selection of responses.

IDEAS WANTED

If you make use of your micro for business or pleasure, or have written a piece of useful software, and would like to share your knowledge and experience with other readers, please write to me.

Send a very brief letter to the address below, with a description and giving your name, address and telephone number (if possible) along with the best time(s) in the week to contact you. I will acknowledge all letters and follow up the most promising ones. The best will be written up in *Acorn User*, only giving confidential information with your permission.

Write to Roger Carus, c/o *Acorn User*, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF. Or use British Telecom Gold: 81:RED001.

SOFTWARE

GOOD AND FAITHFUL HOTEL SERVANT

***The Hotel Servant* is a thorough, well designed and economical management package, finds Roger Carus**

Anyone who runs a hotel or boarding house, or teaches hotel receptionists, should think seriously about this very useful software package. It has been carefully developed by someone who really knows his business.

Clifford Springer, who produced *The Hotel Servant*, belongs to a family of hoteliers and knows all too well the problems of keeping track of customers, their spending and most important of all the forward room bookings which make for profit or loss in the trade.

The package is most suitable for a licensed hotel and restaurant with up to about 80 rooms. It could cope with a larger establishment using more memory and storage, but there are probably better and more expensive systems at that level.

Cost

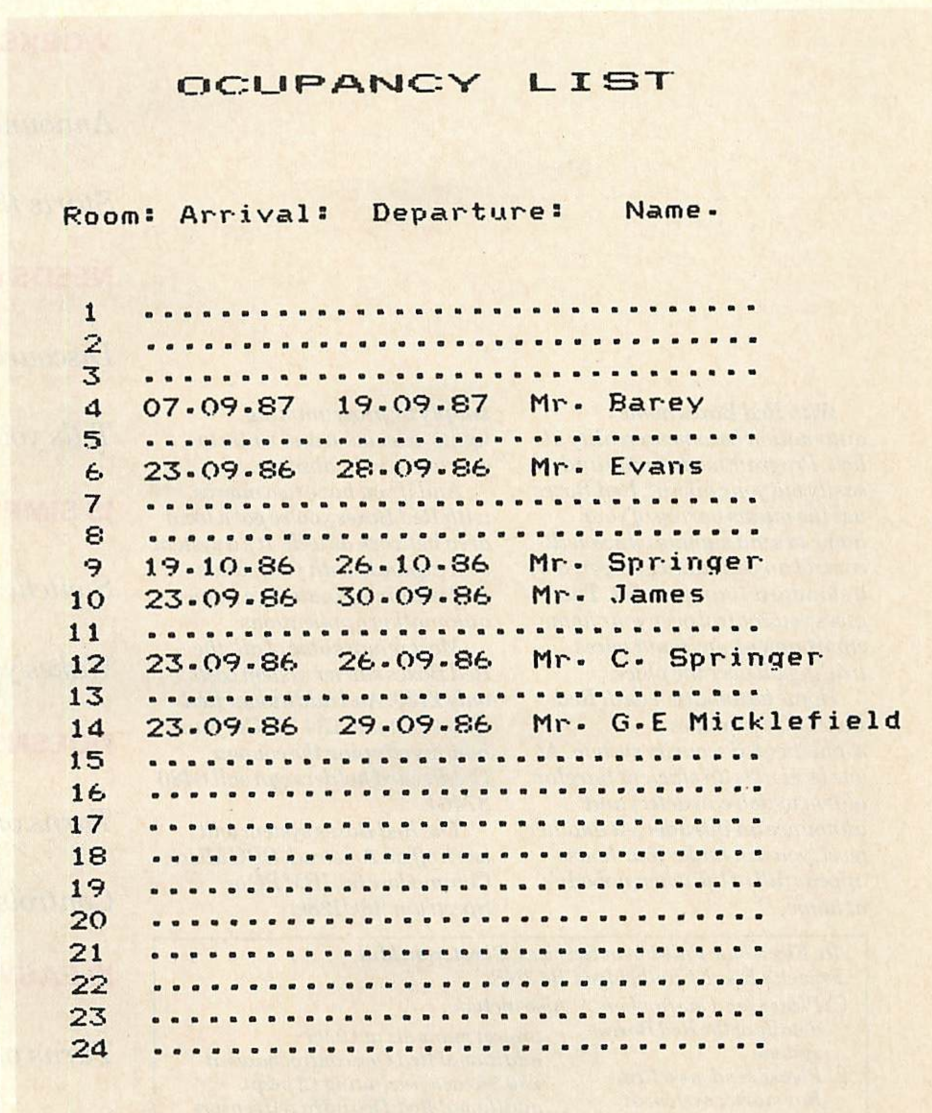
The hardware needed is any version of the BBC micro or Master with double sided twin disc drives (for convenience) having about 800k capacity, a colour monitor (for preference, as the system uses colour graphics) and an Epson compatible printer, costing in all around £1250.

Although clearly a bookings system rather than an accounting package, it does provide some useful financial help such as printing personalised and detailed bills for the guests.

Set up

The first thing it does is record the current provisional and confirmed forward room reservations for up to a year in advance, showing which rooms are free for easy scanning and the state of all such bookings. A single screen displays the room number, arrival and departure plans, number of occupants, name, address and nationality, and records any deposit which has been paid by the customer.

The room list, which is easily adapted to any type of establishment, identifies the types of room and how many of each are available for customers who want, say, a double bedded room with a view. At least 12 different room types are available, and once identified will probably never need any changing.



OCUPANCY LIST

Room:	Arrival:	Departure:	Name.
1	....	....	....
2	....	....	....
3	....	....	....
4	07.09.87	19.09.87	Mr. Barey
5	....	....	....
6	23.09.86	28.09.86	Mr. Evans
7	....	....	....
8	....	....	....
9	19.10.86	26.10.86	Mr. Springer
10	23.09.86	30.09.86	Mr. James
11	....	....	....
12	23.09.86	26.09.86	Mr. C. Springer
13	....	....	....
14	23.09.86	29.09.86	Mr. G.E Micklefield
15	....	....	....
16	....	....	....
17	....	....	....
18	....	....	....
19	....	....	....
20	....	....	....
21	....	....	....
22	....	....	....
23	....	....	....
24	....	....	....

Occupancy is quickly and easily updated

Once a booking is made, or changed as it so often is in the hotel trade, the system easily produces short standard personalised acknowledgement letters of the hotel's own design, and it opens a record file on the customer for any future reference.

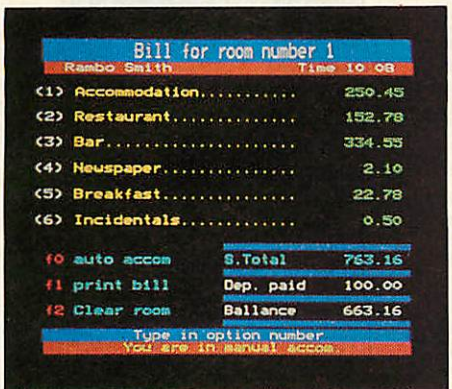
Diary

The diary helps the last minute arrival to find a room immediately, and it also allows the most efficient use of rooms by fitting bookings together.

The restaurant section is equally attractive, with the facility to create quite long à

REVIEWS

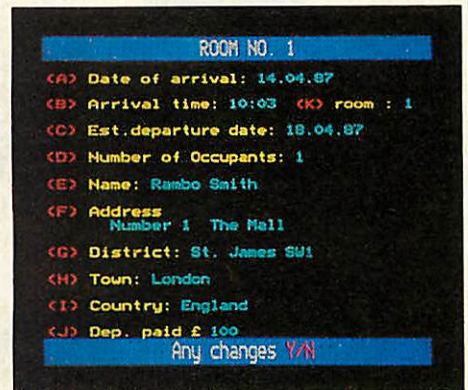
SOFTWARE



Detailed bills are easy



The software's main options



Information on each occupant

THE CLIFF & ROSE
184 BADMINTON ROAD
DOWNEND
BRISTOL BS16 6NP

Tel. 0272 560013

Date 17.09.86

1 Prawn cocktail	0.95
2 Smoked salmon @ 2.30	4.60
1 Steak Diane	7.00
1 Beef Caserole	5.80
1 Grilled Lemon Sole	4.75
2 Strawberry Pavlova @ 1.40	2.80
1 Chocolate Mouse	1.35
2 Apple Pie @ 0.75	1.50
2 Lemonade @ 0.60	1.20
Sundries	0.90
Bar	5.66

Room no. 4 Total 36.51
Table no. 7

Sign.................

Thank you. Hope to see you again soon.

Restaurant menus and bills are also integrated

la carte menus with each item individually priced. Printing effects such as extended characters can be used to enhance the design. Any number of copies can be printed, showing the hotel heading. It can also be quickly amended.

Full bill

The itemised bill for food and drink consumed in the restaurant provides a very satisfactory till roll record, which in turn links to the room number and, when signed by the visitor, is a very reliable record of the transaction.

The suite also produces records for special functions such as banquets and receptions with itemised invoices, and even provides some space for advertising.

At the end of the stay the *Servant* brings all the customer's transactions together in a detailed bill, with each item showing the current VAT rate and the VAT number for the hotel clearly shown.

Mailshots

It also combines with *Wordwise +* to produce mailshots to previous customers who are automatically added to the establishment's mailing list.

The software is menu driven and easily learned and operated, although obviously it would take a little practice to get the best out of the system. It is generally of a highly professional standard in appearance and performance.

For the technical, it represents almost 200k of program and makes good use of overlays. It seems generally user friendly, and the use of colours is imaginative and satisfying. I spotted few very minor errors, such as spelling, and the only real bug has since been removed.

Value

The whole package is expensive on the face of it, but really quite cheap by comparison with the IBM *Hotelier* which would cost nearer £4000 including the hardware, or about three times as much. It does not need much knowledge or understanding of computers to operate and could easily recover the purchase cost in the first year by savings in time for the receptionist. It would of course represent a tax allowable expense and may well have other uses for the business, such as in accounting.

All in all a good business-like package: a pleasure to meet it.

The Hotel Servant for BBC micro and Master costs £175 from Avon Data Systems, 184 Badminton, Downend Road, Bristol, Avon, BS16 6NP

NEW COMPUTER TITLES FROM CHAPMAN AND HALL

MICROCOMPUTER GRAPHICS

Michael Batty, *Professor and Head of Department of Town Planning, UWIST*

Professor Batty skillfully combines information on technical aspects and programming principles with an appropriate emphasis on art and design. He provides a comprehensive treatment of graphics explaining all the technical methods used in its professional study, but makes these accessible to beginners, and emphasises how visually appealing pictures can be produced quickly. As soon as a technique is introduced it is elaborated into a program used to produce a well structured and visually appealing design. All the programs are written in BBC BASIC and the book contains many black and white/colour plates of designs.

Contents: Preface; Introduction: The evolution of computer art and graphics; Graphics primitives and geometrical prerequisites; Combining and transforming regular shapes into simple designs; Elementary picture structures: Two-dimensional flat landscapes; Randomness and recursion: Fractal landscapes; Complex picture structures: Three-dimensional realities; Animation, cartooning and simple computer movies; Conclusions; Further reading; References; Author index; Subject index.

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COMPUTING WITHOUT PROGRAMMING

A guide to software packages on the BBC microcomputer

Judy Citron

It is not necessary to learn programming in order to get the best out of a computer. Programming can be left to the specialists and heavy enthusiasts. The rest of us must concentrate instead on using microcomputers for every day purposes without worrying too much about the bits and bytes. This book shows the user how this can be done on a BBC microcomputer using the most common applications – word processing, database creation, and spreadsheet work.

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This book is a practical, do-it-yourself introduction and guide for the home computer user and student of AI who wants to learn and profit from AI techniques.

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Programs for the BBC models 'B' with disc drive with FREE updating service on all software

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Still the only drawing program available for the BBC micro which gives you the ability to draw really large diagrams and scroll them smoothly around the screen stopping to edit them at any time if required.

Pineapple's unique method of storing the diagram information on disc means that the size of diagrams is limited only by the free space on disc, and not the amount of computer memory you have available. (A blank 80 track disc will allow up to 39 mode 0 screens of diagram).

The superb print routines supplied with the program enable large areas of the diagram to be printed in a single print run in a number of different sizes and rotated through 90 deg. if required. Full use can also be made of printers which have a wider than normal carriage available.

The program is fully compatible with the Marconi Tracker ball described below.

PLEASE STATE 40 or 80 TRACK DISC & WHETHER STANDARD BBC or MASTER VERSION IS REQUIRED

PRICE £25.00 + VAT

DIAGRAM UTILITIES

A suite of six utility programs which add additional features to the 'Diagram' drawing program. The utilities include the saving and loading of areas of diagram to and from disc. The ability to display the whole of your large diagram on the screen at one time (in either 4★4 or 8★8 screen format). The addition of borders and screen indents to diagrams, and the ability to shift a whole diagram in any direction.

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This high quality device comes with it's own Icon Artmaster drawing program and utilities to enable it to be used in place of keyboard keys, joysticks, or with your own programs.

PRICE £60.00 + VAT p&p £1.75
PRICE INCLUDING 'DIAGRAM' SOFTWARE £79.00 + VAT p&p £1.75

TRACKER BALL for MASTER series

The Pointer ROM is supplied instead of the Icon Artmaster disc and enables the Tracker ball to work directly with the MASTER series computers. (e.g. to use with TIMPAINT etc.). Prices are the same as for the standard tracker ball.

POINTER

The Pointer Rom is available separately for people already owning tracker balls, and comes with instructions for use with the MASTER computer.

PRICE £12.50 + VAT

PCB

This new release from Pineapple is a printed circuit board draughting aid which is aimed at producing complex double sided PCB's very rapidly using a standard BBC micro and any FX compatible dot-matrix printer.

The program is supplied on EPROM and will run with any 32k BBC micro (including Master series). Also supplied is a disc containing a sample PCB layout to demonstrate the programs features.

By using an EPROM for the program code the maximum amount of RAM is available for storing component location and ASCII identification files etc. (Up to 500 components and 500 ASCII component descriptions may be stored for a given layout). These is no limit to the number of tracks for a given PCB, although the maximum size of board is restricted to 8" * 5.6".

Using a mode 1 screen, tracks on the top side of the board are shown in red, while those on the underside are blue. Each side of the board may be shown individually or superimposed. A component placement screen allows component outlines to be drawn for silk screen purposes and component numbers entered on this screen may be displayed during track routing to aid identification of roundels.

The print routines allow separate printouts of each side of the PCB in a very accurate expanded definition 1:1 or 2:1 scale, enabling direct contact printing to be used on resist covered copper clad board.

This program has too many superb features to describe adequately here, so please write or 'phone for more information and sample prinouts.

PRICE £85.00 + VAT

CONVERTER LEADS

Converter leads to enable the Trackerball to run mouse software and the mouse to run trackerball software (inc. DIAGRAM). Please state which way round when ordering.

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A new addition to our range of engineering software. Microspice is a very powerful DC and AC analogue circuit simulator package for any model BBC computer.

As well as all the usual facilities available with this type of program, non-linear effects. small signal, noise measurements and sweeps may be performed. Component values may be swept, allowing component tolerances to be investigated as well as thermal performance etc. Comprehensive transistor modelling is incorporated using a 20 parameter Ebers Moll description. The program is supplied on disc with a very comprehensive 49 page manual.

Please write or 'phone for more information

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EDUCATION

NEWS

School software in cash peril

The second part of the Department of Trade and Industry's three-stage allowance for software purchase ends on March 31. This, the largest of the three allocations of money totalling £3.5 million has provided schools with a unique opportunity to indulge in software experimentation. The next financial year sees approximately half the amount of cash available before the scheme closes in March 1988. The outlook from then on may well be bleak not only for software houses, whose industry has seen an artificial boom created by the injection of money, but also for schools which will



MESU's Foster: aims to support

need to fight for finance to outlay on software.

Software houses are now having to plan for the next 12 months. The development of new products may well be pointless since schools will not have the cash to buy them.

As one software producer remarked at a recent conference: 'The bubble looks ready to burst. After that we shall need to look at what schools need to help them use what they've already bought.'

This view, reinforced by the opinions of other software houses, seems to indicate that a change of emphasis is on the way in the development of educational materials for computers. This fits in well with the objectives of the Microelectronics Support Unit (MESU).

Director John Foster has committed MESU to supporting existing materials rather than creating absolutely new initiatives. Their fellowship scheme, in which teachers are drawn out from schools to create packs of teaching materials, is now underway and heading towards that goal. The opinion has been expressed that software houses and these MESU fellows may well be able to complement each other and move towards an arrangement that satisfies both their needs.

Many of the software houses, certainly, are unlikely to survive unless such an initiative is taken. Their demise would be a sad blow to the prospects of development for new ideas.

New adventure packages

Simulations and adventures remain top software purchases in primary schools. Consequently companies like 4mation (*Flowers of Crystal*, *Granny's Garden*, *Box of Treasures*) have thrived. Smaller companies have produced interesting materials too. One such is Sherston Software who are already well-known for *Wizard's Revenge*, *Wizard's Return* and *The Circus*.

Sherston has now brought out several excellent new packages. Their great strength lies not only in the content and structure of their materials but also the excellent graphics.

In *Animal Rescue* the user must discover which animal from the animal park has been



The *Animal Rescue* package

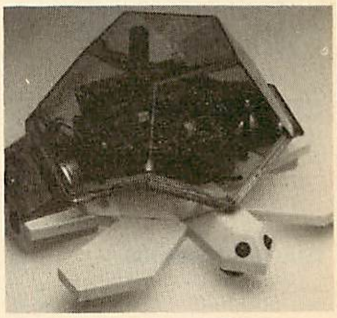
stolen by the nasty troll and then rescue it. This framework is used to present a number of mathematical problems which must be solved before the child moves to the next section. In addition to the two discs, there is a story book and three sheets of large print words.

Space Mission Mada reworks the idea of bringing life back to a region that has been mysteriously made barren. The users are placed in the role of beings from outer space who intercept distress calls from Earth. Their task is to bring seed to the stricken area which will make it bloom again. Again the tasks involved are mathematical.

Story.Starts is a pack of four programs which begin an adventure and leave the user suspended in the jaws of a dilemma! The objective is to use the programs as a means to producing creative writing.

Sherton's materials are pleasantly presented at a very reasonable price at £16 each.

Sherston Software, 8 Court Street, Malmesbury, SN16 0LL. Tel: (066) 840433.



Valiant turtle going strong

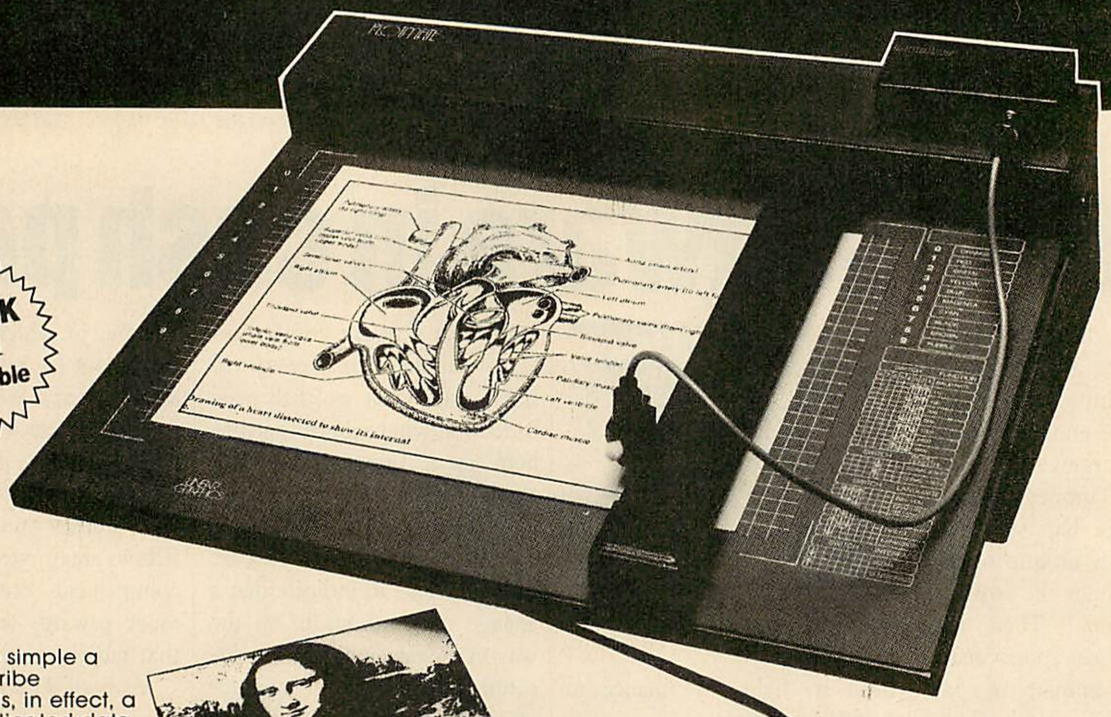
Valiant, who we reported last month had gone out of business, is in fact very much alive and kicking and bringing out a series of worksheets for schools and teachers.

Gill Manvell at Valiant said the company had sold 10,000 of its infra-red beam controlled turtles around the world. More details on page 17 of the main news section.

Valiant's address is 370 York Road, London SW18 1SP. Tel: 01-874 8747.

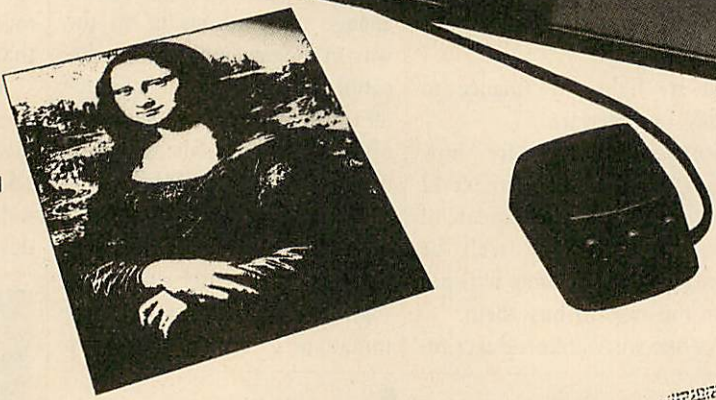
PLOTMATE

A Graphic Illustration



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'Plotter' is too simple a word to describe PLOTMATE. It is, in effect, a highly sophisticated data communications device that greatly extends a micro system's options and capabilities allowing high resolution input and high definition output. It is compatible with all leading micros including the BBC, IBM, AMSTRAD, ATARI and NIMBUS.



PLOTMATE A3M with Linear Graphics' high resolution image scanner — LINSCAN.

NEW RELEASES

HPGL

By expanding the on-board graphics language range PLOTMATE understands commands from HPGL 7475A/7470A industry standard languages enabling compatibility with BITSTICK, AUTOCAD, LOTUS 123, SUPERCALC 3, CHARTMASTER and many others.

IMAGE SCANNING

PLOTMATE's flexibility is further extended by the use of Linear Graphics' own scanner, LINSCAN. This allows PLOTMATE to function as a sophisticated image scanner producing high resolution pictures that can be used within desktop publishing packages such as Pagemaker, GEM, Fleet Street Editor and Image.

EXTENDED GRAPHICS COMMANDS

The in-built graphics commands of the BBC micro that PLOTMATE understands now encompass the extended graphics commands of the BBC Master such as circle and arc drawing, sector and segment filling, rectangle and parallelogram shading.

DOMESDAY

All 'Welcome' disks allow data files produced by the DOMESDAY database to be output in pie, bar and line chart format on the BBC Master.

Not content with providing this wealth of technical capacity Linear Graphics have even introduced a unique discount scheme for primary and secondary schools — the 'Educational Support Scheme.'

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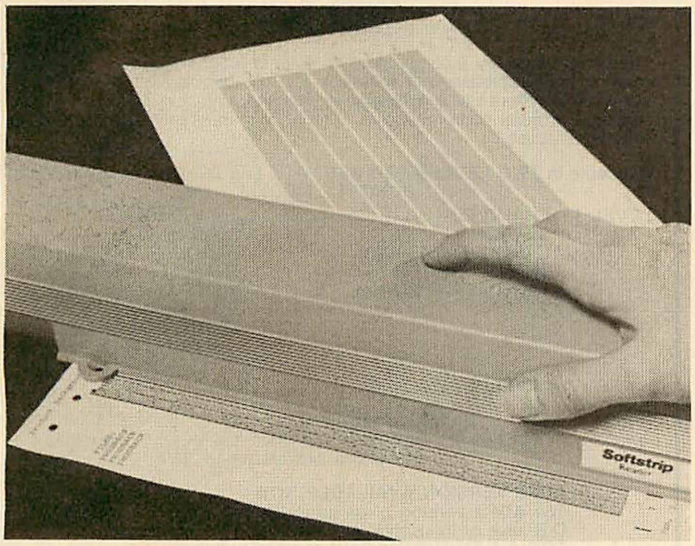
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AU4



New reader makes distribution simpler

The Softstrip Reader looks set to provide a simple means for software distribution within and between LEAs. The reader comprises a scanning head driven along a code line which reads the stored information using near-infrared light. The strips are readable even when defaced and do not suffer from magnetic or other interference. Data density on the strip can vary between 15 and 200 bytes per square centimetre and low density strips may be produced using a dot-matrix printer or photography. Typically, a 12-page double-spaced document may be accommodated in four high density strips.

What makes the medium exciting for education is that public domain materials could be copied using only a photocopier. The finished pages may then be posted and copied again. School projects and datafiles may be transmitted, exchanged and/or stored very cheaply and as a back-up to discs, this medium will be seen as a good alternative.

Even more exciting is the fact that, unlike the rather variable bar-code reader, the publishing of listings in user magazines, local authority bulletins and news-sheets will become a realistic possibility.

The Softstrip Reader costs £200 and comes with a pack of business-orientated software. The creator package for the strips, *StripMaker*, is available at £20 plus VAT and is compatible with Epson and related dot-matrix printers.

Softstrip International, 53 Bedford Square, London WC1B 3DP. Tel: 01-631 3775.

Welcome improvements in Developing Tray program

One the the most popular and straightforward language programs, *Developing Tray*, has been given a facelift.

This package, which involves letter prediction in a blank passage of text, has been freely copiable since its development by Bob Moy. During that time it has been used by English teachers – secondary, primary, special needs, modern languages and a host of other subjects who have found its facilities a means for focusing children's minds on the content of what they are reading.

As letters are predicted the text begins to develop on screen. Strategies for discovering what words are become more sophisticated as children realise the potential of buying one or two specific letters throughout the text. The process is encouraged by a lively scoring system.

The new version, *Developing Tray* 2, has been developed at Redbridge SEMERC. For those already familiar with the program the improvements will be welcome. The user is always in predict mode and may move the cursor anywhere on the screen. Letters and complete words may be bought at the cursor position, the text may be printed slowly on the screen as a means of introduction and it can be printed out at any point. Partly completed texts may be saved with a variety of filenames to allow different groups to save the same text, and specific words, phrases or letters may be displayed when the blank text is first screened. Teacher controlled settings are now easily monitored from a control page and word-processor text may be spooled into the package. Introductory text can be displayed before running the program.

All of these new facilities have come about through recommendations made by teachers who have used the package. The modifications have been programmed by Mike Blamires in co-operation with Bob Moy.

Teachers wishing to obtain a copy of the new package should get in touch with the SEMERC contact schools in their authority or obtain information from their computer education adviser.

Administrator on school trial

Educational Administration Software has introduced a new pricing policy for the *Administrator's Friend* package.

A six month trial period will enable schools to have first hand experience of computer assisted administration for a minimal outlay.

For £50 the company will send schools the entire package and at the end of the trial period, the school may keep the basic package (now reduced to £50) and will be invoiced for any additional modules that they wish to keep.

John Callaghan, the proprietor of the company and himself a school administrator, is confident that schools will want to keep a substantial part of the package when they realise what it can do for them. The company has set up training courses for schools taking advantage of the offer.

EAS, Somerville House, Brunswick Road, Withington, Manchester, M20 9GA.

CommunITel

PICTURE PROCESSING

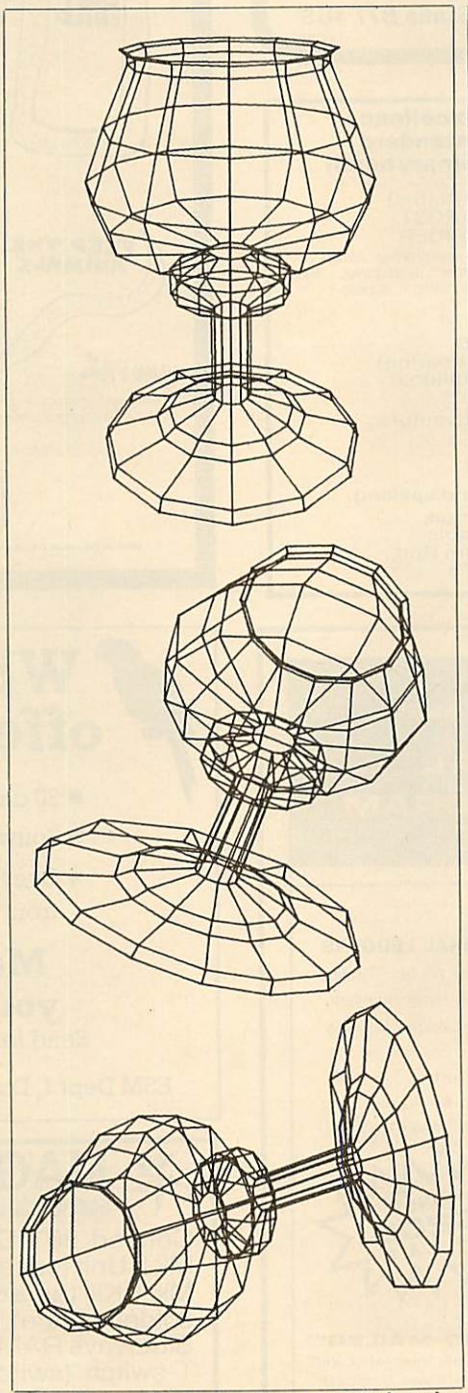
One of the most popular types of software is graphics packages, especially in schools

Chris Drage and Nick Evans

Graphics is one of the most popular areas for using the micro, both at school and in the home. Since we last looked at this topic in November 1985, several new packages have arrived, although some of the old favourites are still going strong.

Our main theme then was that pictures should be treated in the same way as words and we suggested a number of packages that offered 'picture processing' facilities which children can grasp fairly quickly That theory still holds true, but the range of software now allows us to propose a developmental approach to computer art in the school linked to the age and ability of children. They should be led to understand computer art as 'picture processing' – providing the same dynamic approach to editing and alteration as wordprocessing does for writing. Underpinning this is the concept of providing individual children with an alternative to the constraints of traditional materials. In exploring the new possibilities, children need to develop concepts, skills and knowledge commensurate with their age and maturity. With the range of graphics software available today, a developmental approach is both desirable and possible.

The extremely sensitive and accurate Colour Stick light pen from ATP is perhaps the ultimate light pen for the BBC micro. It is accompanied by a superb art program called *Palette*. For upper junior and lower secondary children this offers a number of sophisticated tools, including shape manipulation with twisting and shearing. A variety of colour effects and dithering (to make shades and patterns), are introduced. These are only equalled by AMX *Super Art*. Various type fonts are included. All features are accessed via eight icon-driven menus, but the screen is never cluttered as only one set of facilities is available at any time. Screens may be imported from a number of other graphics packages including AMX, Watford's light pen package and Technomatic's *Novacad*. For secondary students wishing to add colour to a technical drawing draft, *Palette* will be just the right piece of software.



Wire frame line drawings created using Glentop's *3D Graphics Development System*

The Robin light pen is still the only package suitable for young infants, apart from the picture painting program with the Microvitec Touchscreen. It is a real treat to discover that a program as useful as *Paint-brush* is included as part of the package. Its success is due to its simplicity, enabling children to get down to work creating vivid screen images almost immediately. *Paint-brush* software coupled with the natural method of input offered by the Robin light pen, provides an excellent starting point. It is one of the devices singled out before and is still going strong.

If a school has invested in the Robin light pen, many children will have outgrown *Paint-brush* and will be looking for more challenging graphics techniques. *Penpal*, designed to work with virtually any light pen (it is supplied with Watford's), gives the user the maximum freedom to create images. The screen becomes a 'canvas' on which the child-artist works. The unique feature of *Penpal* must be the 'tricks', or special effects option. It invites experimentation with starbursts, perspective aids, scaling, pixtel-plotting and grids. Numerous permutations are possible and children simply love it. With *Penpal* the choice of characters from the keyboard is boosted by a set of 27 shapes and design-units. For a program that will provide children with enormous creative possibilities and encourage experimentation, look no further than *Penpal*. A mouse driven version is aptly entitled *Mousepal*.

Schools which have invested in a Concept Keyboard have *Computer Art*, an excellent package for children of junior school age. It uses a unique adjustable screen window with a number of predefined shapes to provide children with a basic tool kit from which to develop more complex shapes. Its value lies in the totally different approach to picture processing it provides, encouraging children to diverge from the traditional approach.

Picture Craft from BBC Soft is designed for children six to 14 years of age. The software allows children to design and create pictures which may be saved and used later in a number of games and puzzles. The program is controlled via a number of menus. Teachers have access to a set-up menu from which a large number of facilities controlling picture design and

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- part geometry from EDUCAD
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Both packages have explicit input prompts and error messages. This together with over 80 pages of online **HELP** data makes these systems easy to use and easy to learn – an ideal way of introducing this new technology.

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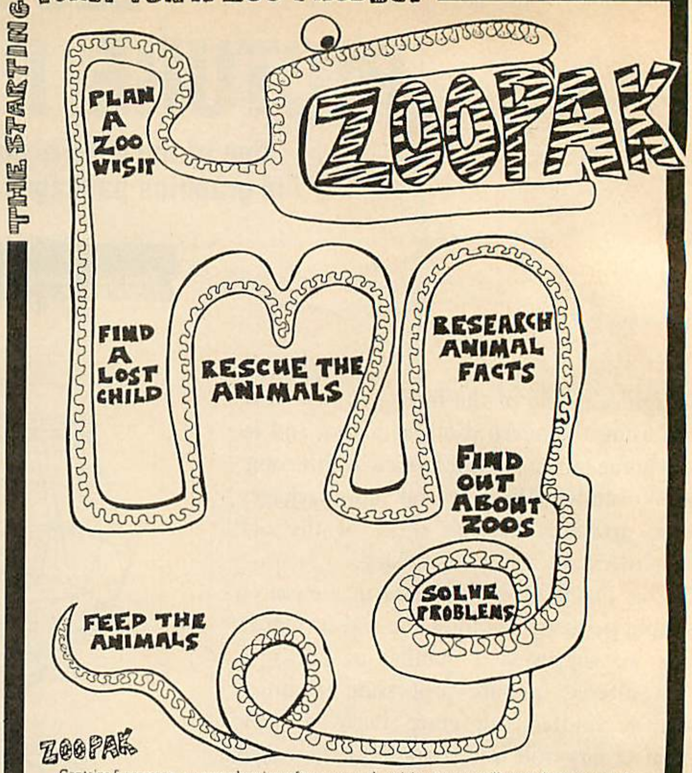
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painting, filing and printing may be selected or ignored according to the ability of the children being taught. The program can be as simple or as complex as the teacher wishes. Flexibility is one of *Picture Craft*'s major attributes.

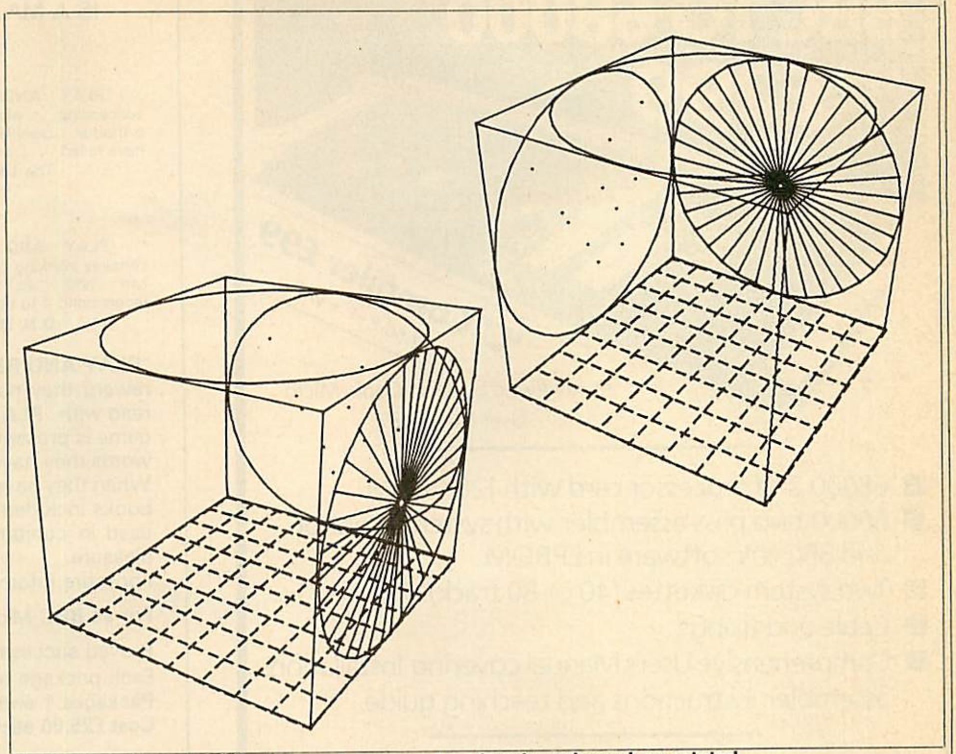
Within the design module, pictures are created using the default set of shapes (which can be redesigned). Reflections, rotations and 'stretches' are possible, and colour is added in the painting module. Not only are the standard BBC micro colours available, but four striped and dotted painting options are also possible. Once saved, the picture may be used in any one of four games:

1 **Swaps:** subdivided segments of the picture are rearranged.
2 **Twister:** picture segments are rotated.
3 **Swaps & Twist:** a combination of one and two above.
4 **Block Slide:** picture transformed into a sliding block puzzle.

There is no doubt the games provide a new dimension to an already sophisitcated graphics package. The 120-page manual has a section on how to integrate the software into mathematics topics on shape, and contains many excellent ideas. *Picture Craft* provides considerable insight into the composition of shape, patterns and design.

At the primary level the child is picture processing with basic computer tools. These involve simple drawing of shapes, filling and manipulation of images – the building-blocks of the more advanced techniques that are available for users of the art and design packages at the top end of the BBC micro market and therefore are more likely to be used in the secondary school. The first issue in choosing any of these packages is that of purpose. What objective does the user have? What end result is desired? How will that result be presented?

The first and main division is the style of the package – roughly dividing into art, design and image processing. Art packages tend to be free-form, so users are not bound by drawing rules but are free to express themselves through the medium of a light pen, mouse, trackerball or other input device (see our July '86 article). Design packages roughly mirror the old-style technical drawing principles. The objective is to create a working drawing, usually to scale, and often from a number of viewpoints or in a particular 'projection' – isometric, orthographic etc. The final style is image processing which may really be an extension of either or both the other styles of package. Moreover it may draw in



The images from the Glentop package can be shrunk, enlarged or rotated

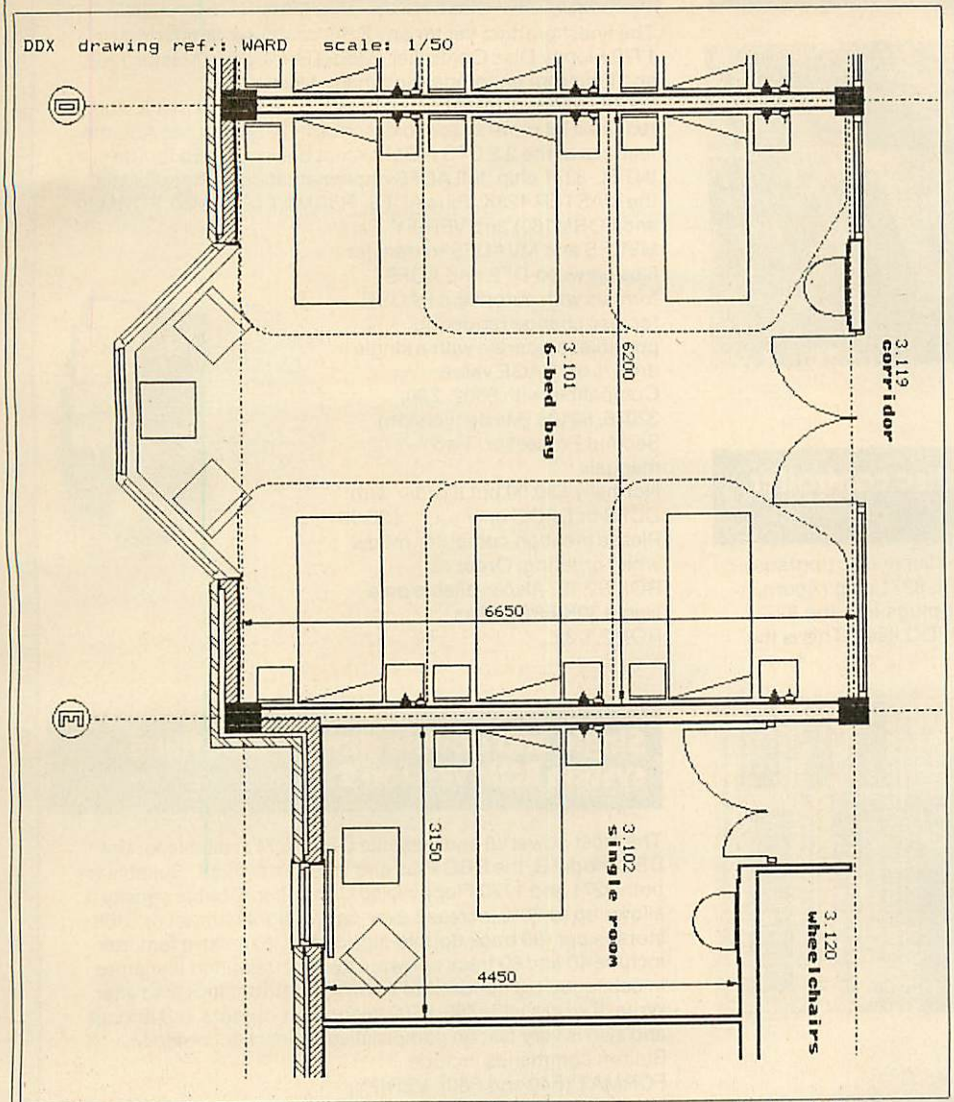
a good deal more in the way of information from the outside world through the 'grabbing' of video stills from a camera, recorder or live broadcast. Also, images from other packages – designs, 'cut-outs' and any other screen or digital information may be manipulated in a number of ways.

Having decided upon the style of package, it is necessary to consider the facilities you require and the target user group. For example, to land a third year set of beginners with Ibbotson's *DDX* would be rather like introducing them to the rules of aviation to fly a paper plane.

In the same way that *Picture Craft* was deemed to be a good all-round package for primary children (and not without relevance in secondary school), so too a good general package for the secondary phase is *Image* from Cambridge Micro Software. *Image* has an immaculate pedigree coming from the Homerton College team working under the auspices of the Microelectronics Education Programme. It provides a number of levels of use, all explicit within the program. The drawing routines are driven using the arrow and return keys if no other input device is being used. A simple fill may be used drawing on pure colours or a mixed fill may be chosen by moving into the 'mixing room' (you were previously in – yes you've guessed it – the drawing room!). Users of the AMX drawing packages will be familiar with the techniques of creating patterns and textures and this is of course available in colour in the 'paint store'. Moreover the user may draw on geometric figures, arcs, rays and dots to create shapes.

Having created any particular shape the user may then compress it in a number of ways, reflect and rotate it. These facilities are not remarkable in themselves since they do appear in other packages. However, the power of *Image* lies in its flexibility. An additional part of the package is 'sketchbook' which has the obvious purpose of allowing the user to try out different variations on a particular theme without losing the main idea being worked on elsewhere. It may also be used in isolation from the main package. One further encouragement for school users is the range of ideas suggested at the back of the manual for imaginative use in the art and design classroom. Add to this the ability to import images from any number of sources – including video – and it soon becomes apparent how comprehensive *Image* is. It can be configured for a number of systems and with a variety of printers – mostly coloured ones although ordinary black on white still produces good results.

Moving into the design field, there's *DDX* from Ibbotson. This is intended for draughtsmen and advanced students in technical design. It can pull in elements from a library of component drawings which may then be edited into the main work. Moreover, split-screen ability means drawings larger than the screen area may be created by moving a window around the



The above room plan was drawn using the *DDX* program from Ibbotson Design Software

drawing area. This technique is used by many advanced packages, not simply because of the memory limitations of the BBC micro but also because it is not physically possible to contain most complete designs in a single screen area.

Naturally, such facilities would merely confuse the issue when put in front of a beginner. That is why, as is common to the use of many applications, we are proposing a hierarchical structure of development from simple processing through to more advanced design techniques.

The packages so far mentioned have only been a selection from the great variety available. Little mention has been made for example of AMX's *Super Art* and its associated *3D Zicon*. Glentop's *3D Graphics Development System* provides the means for creating three-dimensional wire frame images and then rotating them in a number of axes, shrinking and enlarging them, altering their perspective and animating them. Ibbotson Design Software produces a three-dimensional package called *3D View*. This provides similar facilities to the Glentop package although at a slightly higher price. Also from this stable comes *Digital Drawings*, a scaled down version of *DDX*. Again, it should be noted that the Ibbotson packages have a good pedigree – the author is an architect. In direct competition with *DDX* is AB Designs' *AB2* which may be used both as an art and design package. Technomatic's *Novacad* has only been mentioned, yet it is a computer-aided draighting package with the ability, like *DDX*, to produce complex design drawings. It can link to plotters and even drive a moulding tool.

Readers may have seen mention in *Acorn User* of ACADE – the Association for Computing in Design Education. This group was set up a year ago and has local and special interest groups. A meeting will be held during the Eurographics Conference at the University of East Anglia in April this year.

Although we may propose a developmental approach to computer art and design it is not easy to pin down any specific packages since the needs of one school – or rather one group of schools since one should plan across the age ranges – may be very different from another.

What we have tried to do in this article is to explain and point out the areas of importance for consideration by teachers planning such an approach. We have also suggested some titles although this list is by no means exhaustive. As with all such decisions, they are best taken on the grounds of experience and we would suggest most strongly that before buying any art or design package you attempt to see it in action, either at your local computer centre or at a school which already employs it in their curriculum. For those wishing to whet their appetites, a good introduction to graphics is in the series in *Acorn User* October '85 to January '86 by Jim MacGregor and Alan Watt.

The Robin light pen is available from The Educational Software Company (Southport), 108 Parthenon Drive, Liverpool L11 7AQ and it costs £41.40.

The Colour Stick including Palette can be obtained by contacting Advanced Technology Products, Station Road, Lowne, Chesterfield S43 4AB. It costs £39.50 plus VAT for the disc version.

Picture Craft is supplied by BBC Publications, 35 Marylebone High Street, London W1M 4AA. It runs on the BBC B, B+ and Master 128 and retails at £19.95 for the disc version.

Computer Art from AB European Marketing, Wharfdale Road, Pentwyn, Cardiff CF2 7HB, works on the BBC B, B+ and Master and retails at £13.10 for A3 or £12.70 for A4 and comes as part of AB's introductory software set.

Penpal and Mousepal are supplied by Rondo Products, 5 Keswick Gardens, Wembley, Middlesex HA9 7JH. They work on the BBC B, B+, and Master 128 and cost £12 for disc.

DDX (£125), Digital Drawings (£65) and 3D View (£35) are available from Ibbotson Design Software, The Byre, Ecclesbourne Lane, Idridgehay DE4 4JB.

Image is available from Cambridge Micro Software, Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU and costs £39.95.

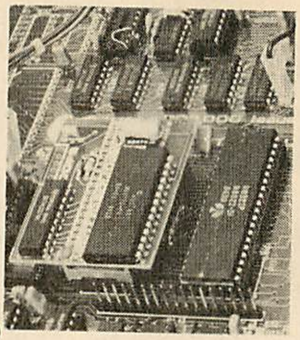
AMS publishes Super Art (£49.95) and 3D Zicon (£24.95), 166-270 Wilderspool Causeway, Warrington, WA4 6OA.

3D Graphics Development System can be obtained from Glentop Publishing, Bath Place, High Street, Barnet EN5 5XE, £25.

SOLIDISK BUDGET DISC SYSTEMS

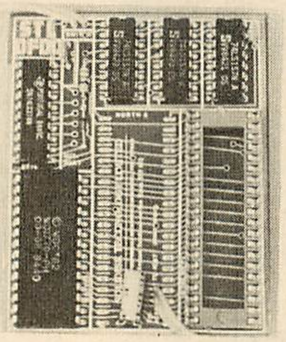
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Solidisk very popular Double Density Disc Filing System (DDFS) is based on the WD-1770 floppy disc controller, the same chip used on the Beeb-Plus and the Master series, totally hardware compatible with Acorn 1770 DFS and ADFS ROMs. The DDFS is suitable for virtually any type of floppy disc drives, 3½" and 5¼", 40 track and 80 track, single and double-sided with or without power supply unit. New low price without DFS ROM .... £35.00 (order as XR/DDFS)



1770+8271, dual floppy disc controller interface

Solidisk DFDC (1770+8271) is the best seller in disc upgrades for Model B's already fitted with an INTEL 8271 chip (Acorn, Watford, Pace, Viglen, Cumana etc). It plugs into the 8271 socket with the latter relocated on the DFDC itself. This is the most convenient way of adding the modern and powerful 1770 without sacrificing the 8271 chip. The DFDC is fully hardware compatible with both Acorn DNFS 1.2 and ADFS ROMs, as well as Solidisk DFS 2.2 and ADFS 2.1 ROMs. The Acorn DNFS 1.2 is recommended for use jointly with the Solidisk ADFS 2.1 as both systems 'self-frugalise' to keep PAGE at the lowest value. We recommend the DFS 2.2 ROM alone if ADFS is not required. New low price without DFS ROM .... £40.00 (order as XR/DFDC)

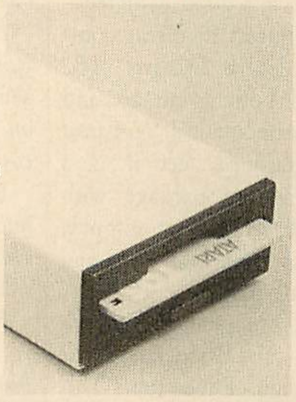


Low cost 3 ½ inch disc drives

The new generation of THIRD HEIGHT 3 and a half inch Floppy Disc Drives offers unprecedented value for money. They feature Double-sided, 80 track per side mechanism offering up to 640K per disc in double density and ADFS. Low power, large capacity, extremely quiet mechanism, robust media and LOWER PRICE than 5 and ¼ drives make them irresistable. They are also the newly adopted Acorn disc standard. Cased, all leads. One year guarantee.

Order as 3.5 INCH-DRIVE (80 track/Double-sided) £90.00

FREE demonstration diskett (double sided) in DFS format while stock lasts (containing a Database, a Word-processor and a selection of games and disc utilities). Separate power supply for BBC Model B, issue 2 or Electron is available at £25.00. Order as 3.5/PSU.



Special leads

A Special set of leads to connect TWO drives in ANY combination of 5¼ and 3½ drives is available separately at only £15.00 or only £8.00 surcharge if supplied in lieu of standard leads. Order as SPECIAL LEADS.

Advanced disc filing system ROM-set (two 16k EPROMS) version 2.1

The finest product yet for any BBC computer fitted with the 1770 Floppy Disc Controller (Model B, Plus and Master 128K and Electron) encompassing many Master 128K specifications. The list of features is so extensive that it would require a lot more space to describe it. In brief, it has ALL the features of the 2.2 DFS ROM except device drivers for the INTEL-8271 chip, full ADFS implementation comparable to the MASTER 128K. Plus ADFS-FORMAT (FORM40, FORM80 and FORM160) and VERIFY. Plus MVDFS and MVADFS to transfer files between DFS and ADFS formats with automatic PAUSE for disc change rendering possible to operate with a single drive. Low PAGE value. Compatible with 6502, Z80, 32016, 80186 (Master version) Second Processor. Two manuals.

Normally £30.00 but if order with DDFS or DFDC only £20.00

Please mention computer model when ordering. Order as ROMS2.1S. Also available on a single 32K EPROM as ROM2.1/32.

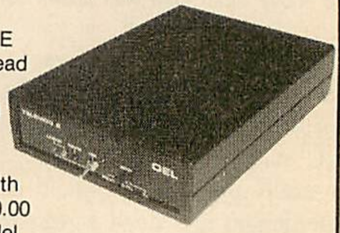


Single and double density disc filing system ROM version 2.2

The most powerful and versatile DFS ROM available for the BBC model B, the BBC Plus and the Master 128K. Suitable for both 8271 and 1770 Floppy Disc Controller. Double density allows up to 60% increase over conventional format or 640K storage per (80 track double-sided) disc. Extensive features include 40 and 80 track software switch, unlimited filenames in catalogue (as opposed to Acorn 31), automatic Read after Write. It works with Z80, 6502 second processors and Econet and also is very fast on comparative review benchmarks. Built-in commands include FORMAT (F40 and F80), VERIFY, DZAP, MZAP, RECOVER, RESTORE, WORD, RTRACK, WTRACK etc... Also, ENABLE M allows IBM PC discs to be read or written to. Extensive User Manual covers many technical details. Supplied on 16K EPROM.

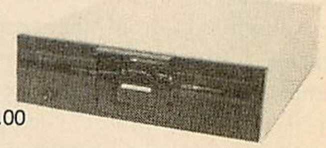
Normally £15.00 but if order with DDFS or DFDC only £10.00

Please mention computer model when ordering. Order as ROM2.2.



Unbeatable quality 5 and ¼ inch disc drives

Also available are NEC or MITSUBISHI 5 and ¼ inch, 80 track, double-sided drives at a very attractive price. Cased in matching cream colour, all leads. Only £109.00

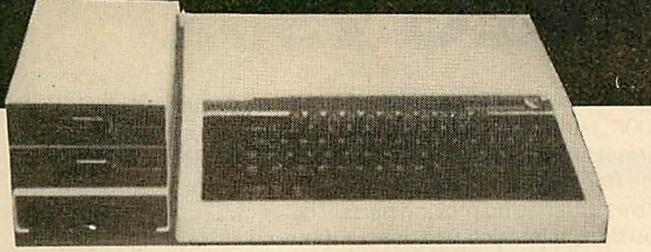


Free bridge unit for twin drive systems

If you pay for two drives on a single order, we will offer you, absolutely FREE this practical BRIDGE unit. Solid steel construction, suitable for all Models of BBC and Master 128K.

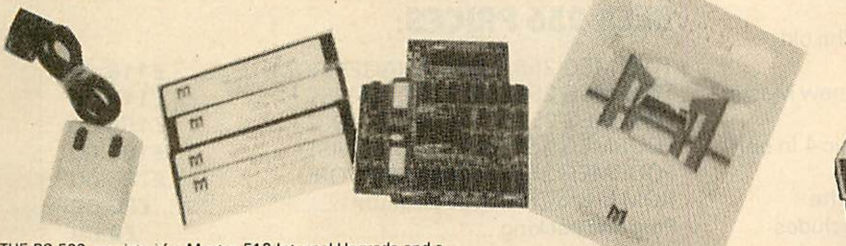
SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

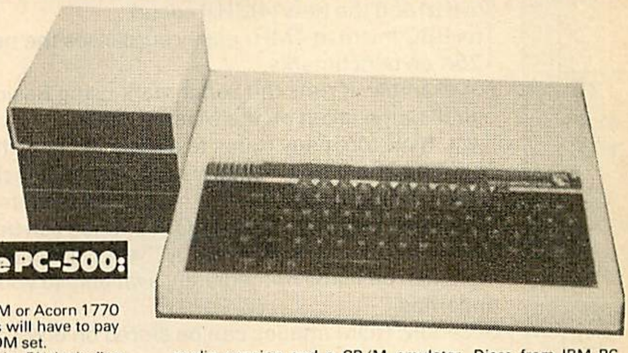
INEXPENSIVE PC CONNECTION FOR THE BEEB:



512K-PC BOARD BY ACORN (ADC08) ADAPTED AND CASED BY SOLIDISK PLUG STRAIGHT INTO THE TUBE STACKABLE ON TOP OR UNDER DISC DRIVES

80186 CO-PROCESSOR MOUSE 4 DISCS ONLY £239 INC. VAT!

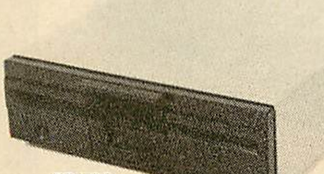




THE PC-500 consists of a Master 512 Internal Upgrade and a Tube adapter, all housed in the same case as a standard half-height disc drive. It's easy to stack the PC-500 on top or under your 5¼ inch disc drives.
Connecting the PC-500 to the Beeb is by means of 24 inches of flat ribbon to the Tube connector, like the Z80 or 6502 second processors. An ON/OFF switch and indicator are also included.

What you get for £239:

— 80186 CPU running at a clock speed of 10MHz.
— 512K RAM, 16K ROM.
— Mouse.
— 4 discs (80 track double sided, double density) containing DOS+, the GEM collection, Winchester initialiser, RAM disc, CP/M emulator, file transfer and format conversion programs etc . . . Literally dozens of utility programs, too many to list.
— Manual



FD400
PC compatible disc

What you need to run the PC-500:

— BBC issue 3 to 7, MOS 1.2.
— Solidisk DDFS or DFDC with 2.1 ADFS ROM or Acorn 1770 with ADFS. Opus 1770 Double Density users will have to pay £20 extra for Solidisk ADFS version 2.1 OP ROM set.
— TWIN 80 track, double sided, double density 5¼ inch disc drives (Mitsubishi, NEC, TEAC, Matsushita or Sanyo). You may use the Solidisk 3.5" drives but will have to pay extra for disc copying service (£10 for 4 discs). 40 track double sided drives will require a special solidisk ADFS ROM set (Version 2.1PC, £25) and disc copying service.
— Solidisk Real time Clock (£30). DOS+ will take date and time directly from the RTC instead of prompting you each time.

Software that runs and software that don't:

The majority of PC and CP/M software (40,000+ titles) for both the 8088 (and family) and the Z80 will run. All generic software (MSDOS 2.1, DOS+ and CP/M 2.2) eg Wordstar, DBASE 2, Supercalc etc will run, special machine dependent packages won't (eg Locoscript on the Amstrad PCW's). File transfer is even better, you can copy, edit or process files from virtually any kind of discs, from IBM to Amstrad, provided that you have suitable disc drives. Extra software may be needed in some cases.
Ring Solidisk Technical for advice.

DOS+ and the GEM collection:

DOS PLUS is becoming the dominating Disc Operating software for 16 bit computers. It is media compatible with PC DOS and MS DOS (2.1). Furthermore, Acorn's implementation has automatic media sensing and a CP/M emulator. Discs from IBM PC, Amstrad, Apricot, BBC Z80 etc. can be read on your computer, and copied into your format. The GEM collection consists of GEM WRITE (a wordprocessor), GEM PAINT (a graphic drawing and painting program) and GEM DESKTOP (a mouse driven disc menu).

Compatible Disc Drives:

Two problems: disc size (5¼, 3.5 and 3 inch) and disc format (single and double density, 40 and 80 tracks, single and double sided). You can READ and WRITE 40-track discs with an 80-track drive. But if a 40-track disc is written to by an 80-track drive, the resulting disc cannot be READ reliably on a true 40-track drive. The 40/80 track switch that you may have on your 80-track drive will not help, because true 40 track read/write heads have a gap nearly twice as large by comparison. If you have to write to IBM PC discs, you will have to buy a compatible drive such as the Solidisk FD400 series (£109).

Public Domain Software:

Solidisk's PC unit is setting up a Public Domain Software User Group to provide PC-500 users with an inexpensive source of Public Domaine Software and Shareware. First year membership is free to all PC-500 owners. PDS discs and manuals are available at the same prices as with Solidisk Sideways RAM software.

SOLIDISK SALE

Electron Disc Interface:

This unit (EFS) plugs into the PLUS-1 Expansion and allows connection of a twin disc drive system and a Winchester. The Disc Interface is based on the same WD1770 chip as used on the Beeb.
The Electron Disc Filing System software in ROM (32K) is a version of the Solidisk ADFS 2.1 thus offers a large degree of compatibility with Beeb software. The system is capable of both Beeb DFS format (single and double density) and ADFS format as used on the Acorn PLUS-3. The unit also has a 16K of Sideways RAM which can be used to load ROM images. The unit is guaranteed for one full year but we warn the users that the built-in Sideways RAM is UNRELIABLE hence the reduced price of only: £50.00
Use a disc system with built-in power supply unit.

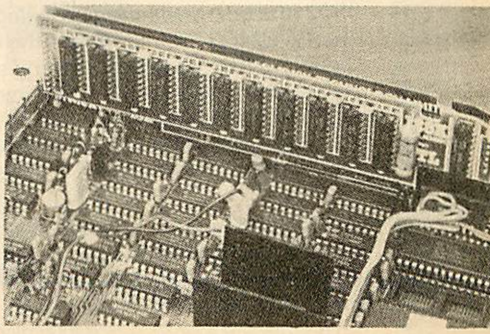
Old Style SWR32 and 128K:

This exceedingly popular system (30,000 plus units sold) enables the Beeb user to load one or two ROM images into the Beeb, make a 16K printer buffer, use DFS with PAGE at &E00, play games, run bigger BASIC, store music and inumerable other uses as supported by a library of 15 software diskettes.
The SWR32 system consists of a BASE UNIT which plugs into the rightmost ROM socket on the BBC board and a (exchangeable) RAM CARD. The RAM CARD also has extension socket for a piggy-back memory board capable of bringing the extra memory to 128K bytes of RAM.
This system is now superseded by the new FOURMEG series and therefore offered at a knock-down price of **ONLY £20.00** for a complete unit, excluding software. The 96K add-on piggy-back memory board is also greatly reduced.
Order as SWR32 .... **£20.00**
Order as SWR128 (SWR32 with 96K extension) **£50.00**
NB: Manual supplied but software (not strictly required) not included.

The supportive software is a series of 15 diskettes, available on either 40 or 80 track DFS diskettes. You can buy any number of VOLUMES although we recommend you buy by PACK of FIVE volumes. PACK 1 (volumes 1 to 5) contains general applications such as MENU, PRINTER, DFSOE00, SILEXICON etc. PACK 2 contains programming applications (SOLIMON, SOLITRACE, TELETEXT EDITOR, SPRITES, DFS and ADFS etc). PACK 3 contains exclusively computer games. Each diskette is priced at only £2.00, software PACK is £10.00 for 5 diskettes.
Order as VOL. XX **£2.00**
Order as SOFT/PACK 1 or 2 or 3 .... **£10.00**

Secondhand Refurbished Beebs:

As a result of the Solidisk MASTERPLAN, we have to dispose regularly of SECONDHAND, refurbished, complete with Double Density DISC INTERFACE, thoroughly checked and fully guaranteed (Labour only) BBC Model B's. Price vary with issues and ages, commencing from £150.00. Please ring.



SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

BEEB EXPANSION

SOLIDISK FOURMEG 256K

The memory limit on the BBC micro can now be definitely a thing of the past. The new Solidisk Fourmeg board offers all you could wish for. It has 256K of extra RAM, a superfast 4MHz CMOS processor, sophisticated memory management sockets for high capacity ROMs and 32K of software in ROM. It is compatible with most hardware add-ons — except Sideways ROM expansion — which it replaces.

Fitting is easy. You remove the existing processor from its socket and plug the new board in its place, push on three colour-coded wires, clip on two mini hooks and its ready. Switch on the computer and you will immediately see the difference.

The message "Solidisk 256K expansion (4MHz)" announces the new memory size and speed.

A switch at the back lets you select between the old (2MHz) and the new (4MHz) speed.

The BBC micro at 4MHz easily surpasses the new Master 128K on benchmarks.

For example, it runs the benchmark using Basic 4 in only half the time taken on the Master 128K.

If you have too many Roms to plug in at once, the Fourmeg 256 offers two ways out. Firstly, it includes additional high capacity (and fast) ROM sockets. Moreover, two four normal ROM images can be stored in one high capacity ROM chip (by "vertical paging") — so more can be made immediately available to your fingertips.

Secondly, ROM images can be stored on disks and loaded into any one of the eight Sideways Ram banks available. If you need more room in "languages" such as VIEW or BASIC, you may use any of the eight SHADOW RAM banks. No user memory is then lost to the screen, whatever the screen mode.

You can turn the extra memory into a RAMDISC or a printer buffer by simple star commands. A Silicon disk of 200K, compatible with both the Solidisk DFS and ADFS formats replaces then one of the 4 physical disc drives. The Ramdisk is at least 10 times faster than physical disk drives and has no moving parts. The printer buffer saves you time, it lets you use the computer while feeding your printer in the background.

It is the most logical next step for owners of any Sideways ROM board or Solidisk Sideways Ram, who can trade in their present boards for the excellent Fourmeg 256.

To complement such a powerful product, Solidisk recommend Computer Concepts Wordwise Plus and Interword.

BEEB 256 PRICES:

TWO MEG 256, 16K MANAGER ROM	£115.00
TWO MEG 256, WITH WORDWISE +	£145.00
TWO MEG 256, WITH INTERWORD	£165.00
FOURMEG 256, WITH WORDWISE+	£165.00
FOURMEG 256, WITH INTERWORD	£185.00
ROM board TRADE IN discount	£30.00
Post and packing	£2.00



Shadow Sideways ROM and Sideways RAM All in One for £50:

This board, the TWOMEG 32K, is specifically designed with the school BEEB in mind so that one can have everything required on a single, compact and extremely easy to install unit. All the necessary software is in a MANAGER ROM (supplied).

The top row of five ROM sockets will take software ROMs, up to 32K each, such as used on the BBC Plus and the MASTER 128K.

The middle row contains 32K of additional CMOS, low power RAM, acting as Shadow Ram or as two banks of Sideways Ram.

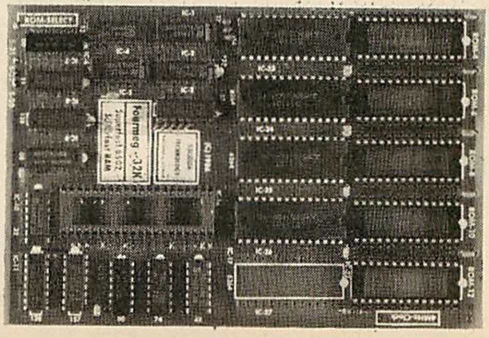
The empty 40 pin socket will receive either the normal 2MHz CPU or the optional enhanced, faster 4MHz CMOS 6502 (the board will then be called the FOURMEG 32K).

The TWOMEG 32K combines the usual functions of a Sideways ROM board — offering storage for up to 160K on board and 64K on the BEEB itself (a total of 224K out of 256K possible) and a SHADOW RAM compatible with major language ROMs such as BASIC, VIEW, WORDWISE, INTERWORD, VIEWSHEET, VIEWSTORE etc.

When Shadow Ram is in use, a small 8K of Sideways RAM is available for loading ROM images or a small printer buffer. When SHADOW RAM is not in use, the entire 32K additional RAM can be used as two banks of SIDEWAYS RAM or as a RAMDISC (available only with Solidisk DFS or ADFS). The Manager ROM also contains a Toolkit to assist programming in BASIC.

The attraction of the TWOMEG-32K board comes from its versatility, its convenient software in ROM and its low pricetag. Furthermore, the board can be fitted with a CMOS 65C02 capable for example of running the new BASIC 4 (some 30 per cent faster than BASIC 2 and also more accurate) or upgraded to FOURMEG speed, comparable to the TURBO board on the Master.

Twomeg 32K	£50.00
65C02 (2MHz) for the above	£10.00
Or upgrade to fourmeg	£25.00
Fourmeg 32K	£70.00
Post and packing	£2.00



SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

MASTER SERIES:

AMB15	Master 128	499.00
ADB12	Master ET	399.00
ADC06	Turbo Upgrade	125
ADC08	80126/512K	228.00
ADF13	Eprom cartridge	14.95

MANUALS AND DOCUMENTATION:

ADJ22	Ref manual Pt 1	14.95
ADJ23	Ref manual Pt 2	14.95

MASTER COMPACT SERIES:

ADB20	Master Compact Single drive	441.25
ADB20+ADF30	Master Compact S/D with TV mod.	457.35
ADB20+ADF31	Master Compact S/D with Mono monitor	537.85
ADB20+ADF32	Master Compact S/D with Colour monitor	687.35
ADF15	RS232 kit	29.90
ADF16	Second 3.5" floppy drive	113.85
ADF17	PAL TV Adaptor	29.90

ACORN SOFTWARE:

SUB27	Viewstore database ROM	59.80
SUB18	Pascal	69.00
	FORTH	19.90
	LISP	19.90
	MICRO-PROLOG	79.95

SOLIDISK SOFTWARE ROMS:

PCFS	Compatible with PC and MS DOS discs	15.00
PCMAN	MANUAL FOR PCFS	5.00
CDFS	single and double density DFS ROM for the COMPACT	10.00
MADFS	DFS and ADFS ROM (32k) for the Master	20.00
LMS	communication ROM for the Master	10.00
SOLIMON	Machine code monitor for Master/Compact	10.00
INSIGHT	Intelligent disassembler, XREF	20.00
UVP	Eprom programmer software (8k)	5.00

ECONET PRODUCTS:

ADF10	Econet plug-in	49.99
AEH17	100m Cable	99.00
AEH18	10station lead set	29.00
AEH19	Econet starter kit	99.00
AEH20	Econet bridge	199.00
AEH21	Econet socket kit	29.95
AES21	Level 2 Fileserver	249.00
AES22	Printer server ROM	49.00

DISC DRIVES:

FD35	3.5" 80-track double-sided single drive	£100.00
TWIN35	Twin DF35	£200.00
FD525	5.25" 80-track double-sided single drive	£115.00
TWIN525	Twin FD525	£230.00
20MB	Winchester new model, low cost SEAGATE	£700.00

PRINTERS:

LX86	EPSON LX86 + 2M printer lead	249.00
LXTF	LX80 Tractor Feed	31.30
LXCSF	LX80 Cut Sheet Feeder	53.53
FX85	EPSON FX85 NLQ + 2M printer lead	350.00
FXTF	FX85 Tractor Feed	30.59
FXCSF	FX85 Cut Sheet Feeder	123.50
NL10	STAR 80 col-120 cps par. 2M lead	289.00
NLCSF	Cut Sheet Feeder for NL-10	59.99
NLRIB	Black Ribbon for NL 10	5.64
MP165	Tractor and pich feed, 165 cps, NLQ, 2M printer lead, exceptional value	260.00
EPSRIB	Black ribbon for Epson and MP165	4.00
J6100	JUKI 6100 Daisy Wheel + 2M printer lead	340.00
JURIB	JUKI 6100 black vinyl printer ribbon	2.00
PAPER	2000 sheets cont. paper, A4 size 11" x 9.5"	14.00

MONITORS:

BM7502	12" Philips hi-res green screen, lead	85.00
BM7522	12" Philips hi-res amber screen, lead	86.00
CM8533	14" hi-res Colour Monitor, lead	299.00
TAXAN3	12" TAXAN Supervision 3, hi-res RGB Colour, lead	375.00
TAXAN2	12" TAXAN Supervision 2, Merdium-res RGB Colour monitor, lead	315.00
XC1404	14" Mitsubishi RGB colour monitor, lead	260.00

SOFTWARE PACKS:

SWPK1	5 software discs, 80 track. Database, spelling checker, machine code monitor, Macro Basic etc. 5.25" format	£10.00
	3.5" format	£15.00
SWPK2	5 software discs, 80 track. Games. 5.25" format	£10.00
	3.5" format	£15.00

DISKETTES:

MD525	5¼" low cost VEREX for all drives	12.00
MD557	5¼" hi-rel MD557, Verbatim DSDD 96tpi	25.00
C102	3.5" low cost Verbatim for all drives	20.00
C103	3.5" hi-rel 90097M Vertbatim DSDD 135 tpi	28.00
C104	3" CF2/MSOFT for all Amstrad drives	39.00

CARTRIDGES:

ADF13	Acorn Eprom cartridge for two 27128	14.95
EPR32	Solidisk Eprom cartridge for one 27256	8.00
RAM32	Solidisk 32K RAM cartridge with battery backup and write protect switch	25.00
MEGA256	Solidisk 256K Mega-RAM card with RAM disc and printer buffer in ROM	100.00
MEGA256	Solidisk 1 Megabyte Mega-RAM card with RAM disc and printer buffer in ROM	POA
	Expected price in April/May	225.00

EXTRA DISCOUNT

If you buy a disc drive or a printer or a monitor at the same time you buy a Master or a Compact, you are qualified for SYSTEM DISCOUNT and a free Software Pack 1 (worth £10.00 or more).

Normal Package Price	System Discount	Reduction
£600-£699	3%	£18-£21
£700-£799	4%	£28-£32
£800-£899	5%	£40-£45
£900-£999	6%	£54-£60
£1000 and above	7%	£70-£££

	Example of system	normal price	Discount	Net price
1	Compact Mono + MP165 printer	797.85	31.95	765.94
2	Compact Colour + Juki 6100	1027.35	71.89	955.11
3	Master 128 + twin F/Drives	729.00	29.16	699.84
4	Master 128, twin F/Drives, CM8533 Colour monitor	1028.00	71.96	956.04
5	example 4 + MP165 printer	1288.00	90.15	1197-84
6	Master 512 + twin F/Drives	957.00	57.42	899.58
7	Master 512 + twin F/Drives, plus 20 MB Winchester	1657.00	115.99	1541.01

SECONDHAND BEEB AND UPGRADE TO MASTER:

We buy and sell good condition second hand Beebs, even by post. Proof of original purchase is required if you are only selling your computer. Reduced commission is available if you are UPGRADING your BBC to a Master, ask for a MASTERPLAN quotation.

BBC Model	we buy at	we sell at
B-issue 2	131	175
B-issue 3	191	225
B-issue 4	187	250
B-issue 7	225	300

The prices above are given as average for very clean and good condition machines. Please ring for stock allocation before you call.

ORDERING BY POST:

All items can be ordered by post, sending the coupon below and enclosing cheques, POs, drafts or credit card numbers or by phone. P and P is charged as follows:
Less than 1 KG (eg software, cartridges and books): **£2.00**
Up to 3 KGs (eg single disc drives): **£3.00**
Up to 10 KGs (eg computer, monitors, printers, twin disc drives): you can specify either parcel post £6.00 or courrier/Datapost: **£12.00.**
Above 10KGs (eg complete system), please either allow generously or give us a ring for quotation.

ORDER FORM

Please fill and send to:

Solidisk Technology Ltd
17 Sweyne Avenue
Southend-on-Sea, Essex SS2 6JQ

Name: ....

Address: ....

....

....

Items: ....

Price: .... P & P: £2/£3/£6/£12

Total: ....

Access/Barclay:

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Solidisk Technology Limited, 17 Sweyne Ave, Southend-on-Sea, Essex SS2 6JQ.
Tel: Southend (0702) 354674 (16 lines).

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USER PORT INTERFACE

Plugs into the User Port. Provides 4 optically isolated, TTL compatible, switched input and 4 relay switched output lines, rated at 0.5A 50V. LED indicators on all inputs and outputs. Easily programmed in Basic. Ideal for all control applications, robotics, experimentation.

Cased	£3.600
Uncased	£32.00

STEPPER MOTOR CONTROLLER

Plugs into the User Port. Will control one 4 phase 12V stepper motor. All control lines optically isolated. Full software control of step and direction. Easily programmed in Basic. Up to 4 controllers can be linked together.

Cased	£23.00
Uncased	£19.00
Uncased less cable	£16.00

STEPPER MOTOR

Model ID35 12V 4 phase 48 steps	£17.00

All prices are inclusive. Write for full details.

Capital City Electric. 39 Oakley Rd, Chinnor, Oxford OX9 4HY.

STAR-SOFT

(BBC & ELECTRON SOFTWARE LIBRARY)

We are a specialist BBC & Electron library with over two years experience,
we know the market.
We stock arcade, educational & business software.
We also specialise in adventure games.
Large selection of software inc. disks
Hire rates from **75p** for 14 days.
Take the **Star-Soft** option and join our computerized library
** Fast service at the cheapest prices around. **
Send stamp for catalogue and cheque/P.O for **£6** to cover membership.
Please state BBC or Electron

STAR-SOFT

16 Martland Cresc, Beech Hill, Wigan, Lancs. Tel: 094247574

AA188

MICRO FIX

FAST REPAIRS FOR THE BBC MICRO BY THE ACORN APPROVED SERVICE CENTRE

191 FRESTON ROAD, LONDON W10 6TH

PHONE: 01-968 9214

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- We have been Acorn service specialists for 3 years and are justifiably recognised as experts in this field.
- BBC micro repairs: average cost £15-£20.
- Complete disc drive calibration: £15/drive.
- Upgrades: Disc – £65 inc. installation.
  Econet – £65 inc. installation.
- Other upgrades carried out as required.
- All repairs fully guaranteed.
- Insured return carriage if required.
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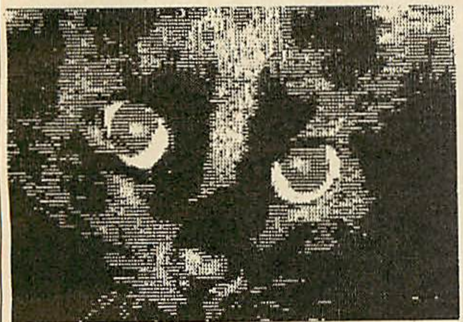
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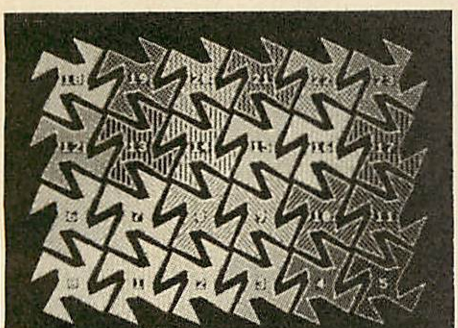
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Order form on page 136.

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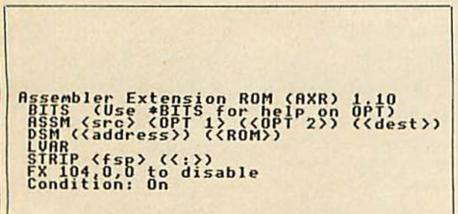
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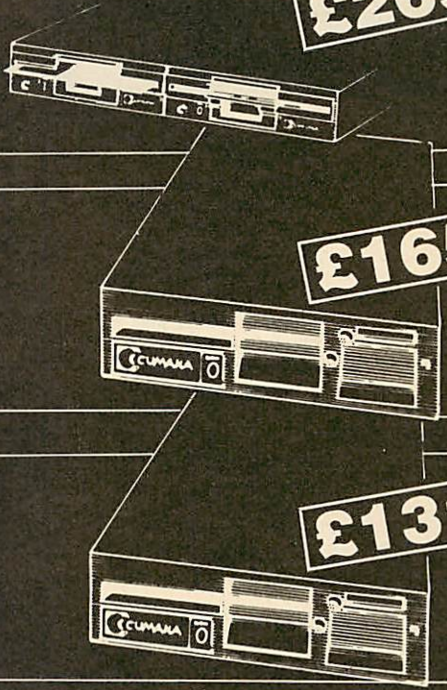
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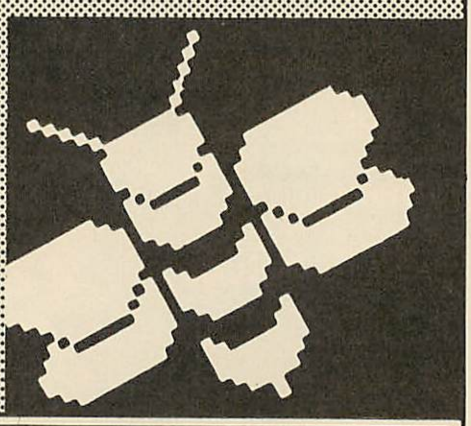
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- Very fast & very flexible

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ACORN USER ADVERTISEMENT PAGES – APRIL 1987

FREE ADS

Electron owner seeks penpals from anywhere to exchange hints, tips, etc. Please write to: Darren Condon, 59 Castle Close, Clondalkin, Dublin 22, Ireland.
Wanted a listing for RTTY for my Acorn Electron. Write to Jo Quaedvlieg, Past Rayenstraat 17, 6137 VT Sittard, The Netherlands.
Penpal wanted to swap info. Must have disc-drive. Details: Paul Hinks, 8 Norwick Close, Ladybridge, Bolton, Lancs. Tel: (0204) 64714.
Penpal wanted with disc drive to swap ideas and programs, aged around 14. AMX Mouse wanted. Tel: (0384) 873507, Richard.
Penpal wanted for owner of BBC B disc drive. Age 12 to 13, S Robshaw, Courtlands, Exmouth, Devon, EX8 3NU.
Printer Brother HR-5, serial type, thermal-transfer inc. paper and leads. London area. Buyer collects. Bargain £55 ono. Tel: 01-902 8351.
Pace Nightingale modem and *Commstar* + manual vgc – £60, ono. Tel: (0723) 584290.
Electron (boxed), First Byte joystick interface, Quickshot II, tape recorder and software (25+) – £120. Tel: Chamara, 01-453 0407.
BBC 40T single disc drive (Microware) – £50. Also System Delta ROM + mail shot application, manuals – £50. Tel: 01-368 1773. After 6pm.
Acorn Z80 second processor, complete with manuals and software, plus *Wordstar* and *DBase II*. Excellent condition – £260 ono. Tel: (04022) 51253.
Microvitec 1441 hi-res colour monitor, cost £506 new. Sell for only £350. 01-866 1248 evenings. Ask for Paul.
Acorn Teletext adapter with Teletext ROM, £90 ono. Also RAMwise II 32k RAM-ROM board with battery backup, £20 ono. (0657) 3415 after 5pm.
BBC B OS 1.2 Acorn DFS ATPL sidewise ROM-board. Basic extensions, *Wordwise*, *View*, disc s/w, Clare's *Beta-Base*, *Elite*, *Aviator* – £250. Tel: (Weybridge) 57476.
Acorn Z80 + original software, £225. Bitstik, £250. 128k Solidisk + soft/firmware, £50. Acorn speech upgrade, £20. Torch modem + software, £80. All as new. Tel: (07592) 3159.
BBC B 1985 1SS 7 with ADFS, DDFS, DNFS. 256 SWR upgrade. Perfect condition, also new FX85 printer offers. Tel: (05255) 2940.
Silver Reed Exp 400 daisywheel printer for sale, £250. With wordprocessor, leads, takes 16" wide paper, friction feed. Contact Imran Ali: (0274) 578258 after 4pm.
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Acorn 6502 second processor, *Hi-Basic*, manual, boxed, excellent condition, £85. Phillips BM7522 Amber monitor, manual, boxed, vgc, £50. Tel: (04463) 5287.
For sale Acorn Electron, 12 months old with tape recorder, Plus 1 interface, free games, leads and guide books. All boxed, Only £85. Tel: 01-961 3865.
BBC B Acorn DFS, Solidisk 32k SWR, twin 40 track single sided disc drives, Philips b/w monitor, Plus software, £375. Tel: 01-555 7392.
Cumana single 40 track (PSU) handbook, little used, upgrade after 2 months of use £75 ono. Phone: Maidstone (0622) 45856.
Voxbox speech synthesiser for Acorn Electron, £20. Tel: (0623) 24903 after 5pm. Ask for John.
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Plus 3 required for Electron, Sherwood. Tel: (0845) 25755 (North Yorkshire).
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Electron, Plus 1, Plus 3, data recorder, *View*, *ViewSheet*, Logo discs tapes, £250. Tel: Bodmin (0208) 5495.
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BBC B OS 1.2 Shinwa CP80, ROM board, Oxford Pascal, Opus 40/80 disc drive +DOS, discs, joysticks, original invoices, many extras, £575. Tel: 01-310 0414.
Aries B32/B12 £90 Centronics text printer £40 Solidisk 32k/WD1770 £50. *ViewStore* £30 modem, *Wordease*, B-ROM, all manuals. Tel: Upminister 29912.
BBC B with 80/40 disc drive and 6502 SP, monitor and software including Pascal, BCPL, £450. Tel: Lee, evenings, 01-435 3743.
Wanted! BBC disc-users to exchange ideas. Write to S Berry, 11 Galpins Rd, Thornton Heath, Surrey, CR4 6EL.
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Wanted BBC B OS 1.2 Geoff, Christchurch, Dorset. Tel: (0202) 486321 X 246 (office) or 485730 in the evenings after 6pm.
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ACORN ABUSER'S

DIARY

AU high and dry

Last month's Abuser has been read in high places. We can now report the following amazing results.

A Milne has been booted out of the BBC as a result of several embarrassing incidents. The two most widely quoted involve employing Jim Day and Dave Atherton:

- Jim 'Kenco' Day, who flooded the BBC Enterprises building, has been 'promoted' to make a documentary on the Thames flood barrier.
- Dave 'Tefal' Atherton, who has long harboured a desire to get into newspapers, has gone off to open a newsagents shop.

Rumours have been flying at the BBC and a 'spokesman' stated that when he leaves, they will be replacing Dave 'Tefal' with a Mr Russell Hobbs and Miss Anne Moulinex (who's affectionately known as 'Molyneaux' to Bruce Smith).

Despite leaving the BBC 'Tefal' is keeping his day job at *Acorn User*.

Pick up a Pickford

Acorn has at last got the deal through for Communicators with Pickfords. It took a long time to sign while lawyers on either side sorted out the bills from Acornsoft's move two years ago.

At the time Pickfords impounded Acornsoft's furniture until the money was paid.

Acorn is now hoping to persuade Pickfords to impound some more furniture (and also a few people).

Remission for Smith

Bruce 'I'm a fairy and my name's Nuff – Fairy Nuff' Smith, who for several years has cursed the pages of *Acorn User* as Technical Editor, has finally taken the hint and quit.

The ignoble scribe has gone on to greener pastures as the Editor of new magazine *Electronic Publishing Now*!

This led our Ed to reminisce



Smith in pre-*Acorn User* days

on the glorious days of 1982 when *AU* first appeared. Bruce's first submission was a review of a utility ROM for the Atom. The text was written on a typewriter (in Smith-spell it's a triperitter), and the listings were handwritten in biro!

Five years and 18 books later, he's at least got a printer and 10 spelling checker programs (much needed). It was Bruce who introduced spelling mistakes into one and two-lettered words.

He has developed some terrible habits however, such as



Relaxing at the weekend

tearing his hair out as he tries to find typing mistakes in his listings (and all the guano in the world won't cure that).

So it's goodbye to him and welcome to Steve Mansfield and Graham Bell, who've now got to do all the work Brucey never got around to.

Anyone who's got shares in Sam Smith's Brewery would be well advised to sell now as there ain't no Sam's pubs where old Brucey's going.



After four years at *Acorn User*

Smith witticisms

- *How do monkeys toast their bread? They put it under the gorilla.*
- *Why did the koala bear fall out of the tree? It was dead.*
- *Why are elephants big, grey and wrinkly? Because if they were small, white and round they'd be aspirins.*
- *What would you call a man sitting on top of a pile of leaves? Russell.*

Don't play with a BBC micro

Jack Scraggyhead of the Nincomputer Grauniad has done it once again.

Frequent Abusers will remember that 'twas his columns that said fractals couldn't be done from Basic because it didn't have recursion (a year after *Acorn User* said it could).

Now the BBC micro doesn't exist as a games machine, at least as far as his awards for machine releases over the past year are concerned. Yet, what do we find if we read on? That the programmer of the year was no less than Geoff Crammond who cut his gaming teeth on the BBC micro several years ago with *Super Invaders* for Acornsoft, and went on to write *Aviator* and *Revs*.

And guest which games he won the award for? No less than *Revs* and *Sentinel*. Guess which machines these games were written for? – the BBC.

We leave it to you to guess who gets the Abuser Woodentop award for this year.



The Superior Collection Volume 1 features one brand new game, Syncron, together with 7 of Superior Software's classic hits for the BBC Micro.

Syncron is a fast-action game set against a backdrop of an enormous graphically-detailed scrolling landscape. The landscape is, in total, 1024 times the size of the screen. You must endeavour to complete 16 hair-raising missions; in each mission you have to collect a number of power cylinders, land your spacecraft on a runway with each cylinder in turn, and finally locate and bomb the HQ Building. Whilst skilfully manoeuvring your spacecraft between the defence pylons and force-fields, you are attacked by alien spacecraft and missiles launched from the land bases. A superb game, worth at least £7.95 in its own right.

BBC Micro dual cassette	£9.95
BBC Micro 5¼" disc	£11.95
BBC Master Compact 3½" disc	£14.95

Here's what the computer press said about some of the other titles on this compilation package:—

REPTON: "This is an astounding game reaching new heights in BBC arcade adventures." . . . MICRO USER

KARATE COMBAT: "Superior's Karate Combat is a superb karate simulation.
Graphics 9
Sound 9
Value 8
Playability 10."
. . . COMPUTER & VIDEO GAMES

C+VG HIT!

AIRLIFT: "Airlift is an excellent arcade game . . . It has a very polished presentation that cannot fail to impress and has the element of addictiveness which keeps you going back for one more try."
. . . A & B COMPUTING

SMASH AND GRAB: "As usual with Superior products the graphics are excellent, with a good use of colour and no flicker. I expect this game will have you rolling with laughter. I certainly did.

Instructions	95%
Playability	95%
Graphics	100%
Value For Money	100%

. . . HOME COMPUTING WEEKLY

Awarded ★★★★★ (Top Rating)"

All games are compatible with the BBC B, B+ and Master series computers.

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A New Concept in Compilations

The Superior Collection Volume 2 features one brand new game, Kix, together with 7 of Superior Software's smash hits for the BBC Micro.

Kix is a fascinating strategic game in which you play the role of the intrepid Kix, whose objective is to take control of each of 20 quadrants; you must cover at least 75% of a quadrant's area in order to seize power over the entire quadrant. You can choose to move quickly or, to earn extra points, take a slower pace — but be ready to speed up immediately if you get cornered. The quadrants are guarded by Tracers who are aided and abetted by the fast-moving Fuse. Two excellent soundtracks add to the atmosphere of this fantastic game, which is worth at least £7.95 in its own right.

BBC Micro dual cassette	**£9.95**
BBC Micro 5¼" disc	**£11.95**
BBC Master Compact 3½" disc	**£14.95**

Here's what the computer press said about some of the other titles on this compilation package:—

REPTON 2: "Repton 2 is better than anything I've played on the BBC Micro or Electron. Brilliant!" . . . ACORN USER

DEATHSTAR: "Deathstar is a super fast, all action arcade classic. It's the sort of game that you can't put down . . . The graphics are excellent and the scrolling is very smooth in all four directions. The pace is fast and furious even on the starting screen. This action packed game is recommended for all arcade gamers." . . . ELECTRON USER

SPACE PILOT: "The professional presentation — well up to the usual Superior standard — coupled with the incredible addictiveness makes Space Pilot a must for all shoot'em-up fans.

Instructions	65%	
Playability	95%	Awarded
Graphics	90%	★★★★★
Value for Money	65%	(Top Rating)"

. . . HOME COMPUTING WEEKLY

CRAZY PAINTER: "Great sound and graphics, smooth and accurate animation, responsive and simple controls.

Instructions	70%	
Playability	100%	Awarded
Graphics	100%	★★★★★
Value For Money	100%	(Top Rating)"

. . . HOME COMPUTING WEEKLY

All games are compatible with the BBC B, B+ and Master series computers.

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